N. E. L. A. Convention Report

Electrical World

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Electrical World

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Opportunities for Service Developed by the War

CONFRONTED by the stern realities of war and the imperative need of meeting the problems arising therefrom intelligently, the electric light and power companies of the country have reason to give earnest attention to the new questions demanding solution. While there is every reason why hysteria and alarm should be avoided and every indication that there will be abundant business not only during the war but for a term of years thereafter, the present is nevertheless not the time for over-easy optimism and neglect of great responsibilities. Happily the National Electric Light Association senses the situation and is proceeding to place its house in good order. It is a courageous grasp of problems which the industry needs, and that we believe is assured by the effective measures now sanctioned. The special meeting of the association supplanting the usual type of convention was dignified, sagacious and rational and revealed far-sighted plans for active co-operation with the government. The selection of John W. Lieb of New York as a war president was as commendable as he is deserving, and the entire proceedings showed a sincere and ardent desire for an intelligent adaptation of private policies to the public needs.

How great the disturbance of the electrical industry in this country will be it were vain to guess. Certainly we realize that this war overshadows all human affairs, and while it lasts it is to be the principal business of the country. All else must be subordinated to it. The government rightfully has the first call upon all resources, both human and material, and is now organizing its quota of men, equipment, supplies and credit. Every man who is eligible under the selective draft system adopted will be subject to call regardless of wealth, position or personal inclination, and the strength of the government will be measured by the degree to which the people concentrate their efforts to this purpose. Labor is limited and fully employed. If 2,000,000 men are to go to the front, and four times that many are needed at home to keep them supplied with food and munitions, it is patent that all industries having no military value must be prepared for readjustment. The central stations of the country will adapt themselves quickly to changed conditions. Greater efficiency will be developed, women will be substituted for men in many departments and labor-saving schemes widely adopted. By this means the companies will place themselves on a war basis and release for military needs all men not absolutely essential to the operation of the system.

IN THE case of fuel and other supplies there will naturally have to be a considerable shift. Husbanding of coal will be imperative owing to the lack of labor in the mines and the insufficiency of transportation. The electric utility companies will as a result interconnect their systems as a matter of economy and as a matter of public policy. Coal will not only be hard to get but will be very high in price, and all this in face of the fact that the systems will be more heavily loaded. Efficiency of production will mean what it never meant before, and co-operation between public utilities will reach a maximum. The railroads of the country have already pooled their equipment and physical resources and are being operated as one system. Co-ordination which will result in very material savings of fuel, equipment and men and mean more effective service the central stations of the country will do their utmost to carry out.

The war involves the country in great expenditures. Every one recognizes that taxation must be heavy and that huge loans must be floated. There should not be any hoarding on that account because that would bring about cessation of industry which would be a worse calamity than the war itself. It is well to bear in mind that there is not going to be less work to be done; there is more work than ever in sight. There is no reason to anticipate any conditions under which credit will be difficult to obtain for the regular business operations of the country. Right now public utilities may have to wait until the government has secured sufficient funds for its purposes, and their business and profits may be subjected to heavy taxation in addition; but such burdens will fall on all industry, and what with wants kept down to a minimum and economies effected some of the increases will be passed on to the consumer. Fortunately for the industry, the affairs of the N. E. L. A. are in the hands of men so experienced and capable that the uncertainties of the moment will give way before clear and constructive policies. The problems will be solved, questions will be answered and the central station will be enabled to keep its proud position as a utility of indispensable value to the nation. The signs for a very profitable future are propitious.

Lighting Outdoor Substations

A BRIEF description in this issue of the floodlighting of outdoor substations will give some very useful hints to those who have to deal with this somewhat troublesome problem, and incidentally it offers suggestions on the protection of such parts of transmission systems from malicious attack. The requirement of a large amount of space is one of the few drawbacks of the outdoor substation, and this is really not a serious matter under ordinary conditions, although it complicates the situation with respect to seeing what one is about if repairs or changes have to be executed. It is to relieve this difficulty that the floodlighting scheme described by M. M. Samuels is worked out. It is really rudimentally simple, consisting merely of turning upon the outdoors apparatus the light from four projectors, each carrying a 500-watt lamp. The point most worthy of note in this application is the use of two distinct types of lighting units, one giving a somewhat concentrated beam for lighting the high-tension apparatus, the other giving a much wider beam and covering the somewhat extensive low-tension equipment. A less shrewd judgment in making this installation would have sacrificed something to the fetish of uniformity, and thereby would have lessened the efficiency and general usefulness of the installation. The floodlight is coming to be a rather important item in central station affairs, and we have seen no better example of its usefulness than this direct application to the lighting of the vital parts of the high-tension plant.

Underground Construction

THE recent rise in the price of copper, or, to be more specific, the recent fall in the purchasing power of money, owing mainly to conditions brought about by the world war, has checked the ordinary growth of electric cable conductors and has compelled the existing cable systems of our large cities to be loaded more nearly up to the full economic limits than heretofore. This means that more attention is being devoted to determining the temperature elevation of cables in service than in the past, and that the margin of safe carrying capacity in cables tends to acquire increased importance. The report of the N. E. L. A. committee on underground construction and electrolysis contains useful information on this subject.

Reference is made to the advantages claimed for three-core cables, consisting of three separate metallicly covered cables in an external cylindrical sheath, over three-cored cables having individual as well as joint insulation. The advantage is attributed to the equalization of tangential electric stresses. Such triple separate metallicly covered cables have, indeed, been known for many years, and the electric stresses in them are all radial; but their advantages in this respect have only received recent recognition, with increasing transmission voltages and dielectric stresses. The report contains some interesting information concerning the uses and connections of split-conductor cables, which lend themselves particularly to automatic disconnection in case a sudden fault should develop in them. A number of special cable devices and tools for underground construction are also described in detail.

Standardization of Meters

THE meter committee of the N. E. L. A. has made an interesting report. Watt-hour recording meters have become so thoroughly standardized that but little change has been made recently in well-established types. Demand meters, however, have come into extensive use of late years, and the report deals with them at considerable length.

There is perhaps no type of electric apparatus which calls for more standardization and testing than meters. The aggregate amount of capital involved in the recording meters of the United States is enormous, as is evident from the fact that the great majority of all the watt-hours consumed in the United States are recorded on watt-hour-meter dials. In fact, some enthusiastic meter men take the position that the object of all the power plants in the country is to work the dial mechanisms in their meters. In a certain sense this cannot be denied, but the perspective betrayed in the assertion seems distorted.

In the care and maintenance of customers' meters the practice of oiling the jewels is recommended in the report, and it is indicated that the practice of keeping oil in the jewels is common among the operating companies. It would be interesting to know why oil increases the working lifetime of a jewel. It seems likely that the benefit is not so much in diminishing the rubbing as it is in levigating dust particles, so that dust may be kept out of the reach of the rubbing surfaces.

Inductive Interferences

IN THE earliest days of electric communication the telegraph lines were the only ones seen on the highways. These ground-return telegraph lines had the entire field to themselves, and inductive disturbance, except to a small extent, between neighboring telegraph circuits was undreamed of. During the last thirty years, however, electric light lines, telephone lines, railroad lines and power-transmission lines have been jostling each other along the highways. The city streets became such tangled meshes that the wires had to be placed underground. The expense was great, but it had to be supported in congested city thoroughfares. Out in the country the cost of placing the wires in underground conduits would be prohibitive in most cases.

The inductive interference between neighboring lines on the same highways rapidly became obtrusive. The telephone lines were the principal sufferers, and next the telegraph lines. These communicating systems, with their feeble currents and relatively sensitive instruments, were no match for the light and power circuits with their strong currents, and the mutual interference between the latter systems has been negligible.

As the country develops its population and resources, the tendency to inductive interference steadily increases. More power circuits spring up. Existing power circuits ramify. Every little town and village needs its electric light and railroad lines. The telephone and telegraph lines extend and multiply. Meanwhile the number of highways along which all these lines are carried remains almost stationary, while private rights-of-way for new lines are luxuries that can be afforded only in special cases. Consequently all the highways become congested, and the various types of line are driven into closer proximity. Under these conditions it is no wonder that inductive disturbances thrive and multiply.

The report of the committee on overhead lines and inductive interference to the National Electric Light Association convention draws attention to the necessity for co-operation between the engineers of the power systems and those of the telephone systems for their mutual benefit. The principal rules for minimizing interference are to avoid depending on ground-return circuits and to transpose the conductors systematically. However, unless the engineers on both sides co-operate to the end that the differences between telephone and electric power transmission companies be speedily adjusted the constituted authorities will stipulate what shall and what shall not be done.

Keeping an Eye to Windward

THE enormous increase in the price of steam coal is a sufficient cause of worry in many a central station. Large plants handling their own mines or having long-term contracts can look forward to going through the probable period of the war with some equanimity. Smaller establishments cannot, for the price of coal has shot up out of all comparison with the scarcity that confronts us because of the difficulties of transportation. Possibly the government may succeed in effecting some measure of relief, but at present small stations undefended by contracts must be prepared to pay any price for coal which the coal pool shall name, unless the government, as it may, steps in and lays an iron hand on the situation.

Facing such conditions, the need of remedial measures is obvious, and one of them which can be applied to many a small station is described in this issue in L. D. Shank's brief account of how one should beat the game by installing an oil engine. The plant he describes is typical of many an installation of moderate importance. It had a good steam plant, but, realizing that the rising price of fuel was becoming a very serious matter, the management deliberately changed over to oil-engine drive. The particular case is interesting in that it discloses some of the differences which depend merely upon size in picking out a suitable power plant. On general principles a four-stroke-cycle engine would have been chosen for the sake of economy, as Mr. Shank points out. It is held, and in general very correctly, that the two-stroke-cycle engine is not so efficient, particularly on varying loads, as the four-stroke-cycle type. It is, however, simpler, and in a size as small as 125-kva. simplicity, low first cost and low repairs count more heavily than does a moderate difference in oil consumption. The experience in this particular case seems to have borne out the wisdom of the choice.

At the present time one of the steam-driven sets is kept ready for operation, but the bulk of the work falls to the oil-engine set. An ingenious modification to improve the efficiency of the combined system is the water jacketing of the exhaust pipes from the oil engine to provide circulating water in the spare boiler. In this way the waste heat of the oil engine is utilized to keep the water in the steam boiler at a temperature which enables steam to be made quickly and which cuts out the usual expenditure of fuel for banked fires.

The net result of the scheme here worked out is from the commercial standpoint highly satisfactory. The actual saving, as reckoned on five months' operation, has amounted to about $32 a day, which is a very practical answer to all the theoretical objections which might be raised against the change. In point of fact, ordinary steam plants of so small output as are here required are not very efficient and can often be beaten out by oil engines with the greatest readiness. The chief practical question as it appears to central station men is at what approximate output the costs by steam engine and oil engine become equal. This is a question which can be answered only by a careful investigation of detail in each particular instance, for one cannot in these times generalize on either the cost of coal or the cost of oil. Appearances all indicate, however, that the coal costs are likely to run up very seriously, so that it would not be surprising to see many a small plant follow the precedent here laid down.

The Coming Issues

OWING to the variety of conditions under which underground cables may be installed and operated, it is sometimes difficult to foretell what performance can be expected from them. The rating of a cable may be affected by any number of causes. All possibilities have to be considered if reliability of service is to be assured. Some of the principal causes of cable failure experienced by one large operating company will be outlined in the next issue, dated May 19. Remedies will also be suggested for most of the troubles. In the same number will be an article which points out the practical value of measuring reflection factor in connection with illumination calculations and which explains how the difficulties usually encountered in such measurements can be minimized. The second section of Walter Arthur's article on the characteristics of standard inclosed fuses, which was started in the March 10 number, will also appear in the next issue. The number following, dated May 26, will contain, besides the regular departments and technical and operating material, feature articles treating of various phases of central station, commercial and managerial work. One article will present the practices of the industry in dealing with the customers who use energy without paying for it.

N. E. L. A. in Historic War Convention

Patriotic Outbursts Mark the Proceedings of the Special Meeting to Consider How the Industry Can Best Serve the Nation—John W. Lieb the New President

IT WAS essentially a war convention that the National Electric Light Association held in New York on Wednesday and Thursday of the present week. Stripped of all things but war problems and necessary formal steps to continue the power of the organization, the fortieth annual convention passed into history in strict conformity with the rigid requirements of the times. From the opening words of President Herbert A. Wagner to the final adjournment half a day earlier than anticipated the serious responsibilities resting upon the industry to make the best use of its facilities for the country were the dominant note of all business transacted. Co-operation among members, co-operation with gas or other utilities, most of all co-operation with the government, were pledged by every act and word. And as a token of the attitude of this great organization there were the bright display of the colors of three allies and the military salute and patriotic demonstration which came with the raising of the "Star-Spangled Banner."

"As this is primarily a business meeting," said President Wagner in calling the members to order at 10.30 a. m. on May 9, "we will proceed at once with our program without formality."

W. F. Wells, Edison Electric Illuminating Company of Brooklyn, then took the chair while Mr. Wagner read the annual address of the president. An abstract of this address is published on pages 891 and 892. In accordance with the usual practice, Mr. Wells appointed as a special committee to report on the address Joseph B. McCall, E. W. Lloyd and Holten H. Scott.

FULL AUTHORITY GIVEN TO CO-OPERATE WITH THE GOVERNMENT

Resolved, That the sub-committee appointed by the public policy committee—namely, Messrs. Lieb, Edgar, Insull, McCall and Wagner—be continued as a committee of the association, with full authority to take such action in behalf of the association as they may deem advisable to establish full co-operation between the United States government and the electric light and power industry of the country, to the end that the best industrial results may be obtained in connection with the prosecution of the existing war. The committee is authorized to establish or join in establishing and maintaining an office in the city of Washington if deemed advisable and to incur such expenses in the performance of its duties as it may find necessary.

Patriotic Demonstration

Following the appointment of the committee on the president's address a bugle was sounded, a squad of khaki-clad men marched in and the flag was raised, while the convention joined in the patriotic strains of "America."

President Wagner then resumed the chair and called upon Secretary T. C. Martin for his annual report.

Public Policy Committee Report

W. W. Freeman, Union Gas & Electric Company, Cincinnati, presented the report of the public policy committee, of which he is chairman, saying:

"Your public policy committee has devoted considerable time and thought during the year to the proposed plan of enlarged activities as discussed and authorized at the last convention, subject to the necessary and financial support being forthcoming from the member companies.

"A definite call for subscriptions was issued by the committee in a letter to the member companies dated Feb. 14, 1917; the responses to this letter were distinctly encouraging and indicated a willingness on the part of the companies to support the plan to an extent adequate to meet all anticipated requirements.

"A meeting of your committee was called to formulate plans for the inauguration of the work, but in the interim before the date of the meeting war was declared against Germany, and when the committee met it was the unanimous opinion that all such plans should give way to the more immediate and imperative problems growing out of the war situation.

"The committee desires to thank sincerely the member companies for the support and confidence which were so promptly and heartily proffered in this matter.

"It is hoped that events may render it practicable and advisable to renew favorable action upon the plan at a date not far distant.

How Can We Best Serve?

"The thought now uppermost in the minds of the committee is how we as companies and an industry can most effectively serve the nation and protect our properties in the emergency and the peril with which we are confronted.

"It is realized that the continued maintenance of reliable service on the part of the public service companies is as necessary a factor in supporting our sinews of war as is the raising of the army.

"We have in our charge, to a considerable degree, the health and safety of the public, and must conserve them as a public duty, not less than from financial considerations.

"On the other hand, we can furnish through our organizations, especially with our technically trained men, much valuable information and assistance to the government.

"Realizing the importance of these considerations, your committee a month ago appointed a sub-committee on war conditions, consisting of Messrs. Lieb, Edgar, McCall, Insull and Wagner. This committee has conferred at length and consulted freely with the National Defense Council, with federal and local

officials and others qualified to furnish information and advice.

"The public policy committee respectfully recommends that its committee on war conditions be continued as a committee of the association with direct authority to represent the N. E. L. A. in the securing of information and the formulation of such plans of action as may seem necessary or desirable."

Mr. Freeman added that he would be glad to submit, after the discussion, a resolution which, if adopted, would carry out the thought of the committee.

[Later in the proceedings such a resolution was passed; it is published on the opposite page.—EDS.]

President Wagner asked J. W. Lieb, New York Edison Company, chairman of the sub-committee of the public policy committee which Mr. Freeman referred to as the committee on war conditions, to report on the progress that that committee had made, and also in regard to the conditions confronting the industry.

JOHN W. LIEB

Who Will Join the Responsibilities of War President of the N. E. L. A. with His Work as Chairman of the Special Committee on War Conditions of the Public Policy Committee

REMARKS OF MR. LIEB

Mr. Lieb, speaking informally, said in part:

"Your committee has given the matter of the relations of this industry and its allied interests the most careful consideration. As a result, it was felt early in our conference that it would be wise to ally ourselves with the sister industry, the gas industry, with which we have many problems in common."

Mr. Lieb then presented detailed information bearing on various problems created by the war, showing how the unemployment which existed in the British Isles at the commencement of the war was not comparable with the present scarcity of labor here. He paid a glowing tribute to the great body of young men in the electrical industry who would be ready to respond to the call of the nation, but said that another vital question, that of continuing utility service, was concerned.

EXPERIENCES IN ENGLAND

Quoting from the London *Electrical Review* of April 20, 1917, Mr. Lieb reported that a commission representing the electricity supply undertakings in Great Britain had taken up with the government authorities the question of the continual drains.

The British committee presented to the authorities the great importance of electricity supply from both the public utility and munitions standpoint, the very large number of employees affected and the amount of machinery dependent upon it, the danger of too severe cutting down of the staff and employees in electricity works, the necessity of considering employees in electricity departments from the standpoint of technical capability, experience and physical fitness, the difficulties, dangers and limitations of substitution, the employment of disabled soldiers and sailors and women and girl labor, the shortage of labor in the neighborhood of some of the large undertakings, the difficulty, and in some cases the impossibility, of making even the slightest reductions in the staffs of small undertakings, the necessity for each case to be considered on its merits by expert advisers; that women labor is employed in some instances to the extent of 25 per cent or more, but that the extent necessarily depends upon the local conditions that may prevail.

The result was that the most important men of the undertakings subject to call to the colors received temporary exemptions of a month or two months at a time.

CARE OF DEPENDENTS

On this subject Mr. Lieb said in part:

"Our industry has ever been a leader in providing for the welfare of our workers. Our workers are very dear to us all and have a first call, second only to that imperative call of the nation, upon our consideration and care, but it is very necessary that we shall not plunge into this matter of deciding what it is desirable or best to do hurriedly, but give it careful and thoughtful consideration.

"Our allies in Great Britain went into the matter with enthusiasm in the hope to go the limit in taking care of their men, as was done in the case of Canada, but they soon found out that to carry out the original expectations would lead the companies into bankruptcy. Therefore, this question of adjustments for employees who go to the front is one requiring the greatest care and will no doubt form an important consideration for your committee in consultation also with other similar committees, so that our industry may align itself with what is or may be the best policy to pursue, a policy which will commend itself to the public and which may be practicable in view of the condition in which our financiers may find themselves."

Continuing his presentation of data in the hands of the committee, Mr. Lieb read a letter received by Secretary Martin from P. H. Gadsden, Charleston, (S. C.) Consolidated Railway & Light Company, who spoke of

the opinion of a special committee on war payrolls of the United States Chamber of Commerce. This committee held that employers should not assume any responsibility for wages of employees enlisting in the army or navy, on the ground that this burden should primarily be borne by the government, and that, in case government provision was inadequate, it should be provided for by public subscription as in Canada and England. Upon analysis of the conscription bill now in the Senate, the committee felt that under such an act the problem would be reduced to a minimum, as it specifically eliminates men with dependent families.

"This simply means," Mr. Lieb added, "that we are still not in a position to take a definite stand as to what may be the best policy to be pursued, and your committee will consider it one of its duties to follow this up, with a view of making a report at the proper time, and an interim report if it becomes necessary, through the public policy committee."

The possibility of substitution of women for men called to the colors was discussed briefly by Mr. Lieb in the light of foreign experiences. Women are taking the places of three-fourths of the electric railway motormen in Germany. Women are now switchboard attendants, meter readers, etc., in Great Britain.

Mr. Lieb also mentioned the scarcity of metals and substitution practiced in Germany and the possible revolutionary permanent effect.

Mr. Lieb added that one of the problems here will be the great readjustments that may become necessary in company construction due to the impossibility of getting apparatus. It may also be necessary to transfer apparatus destined for one company to another whose demand has grown imperative, owing to necessities of local munitions or some urgent supply-manufacturing industry. It is believed that the committee may be called upon to represent the industry in such readjustments.

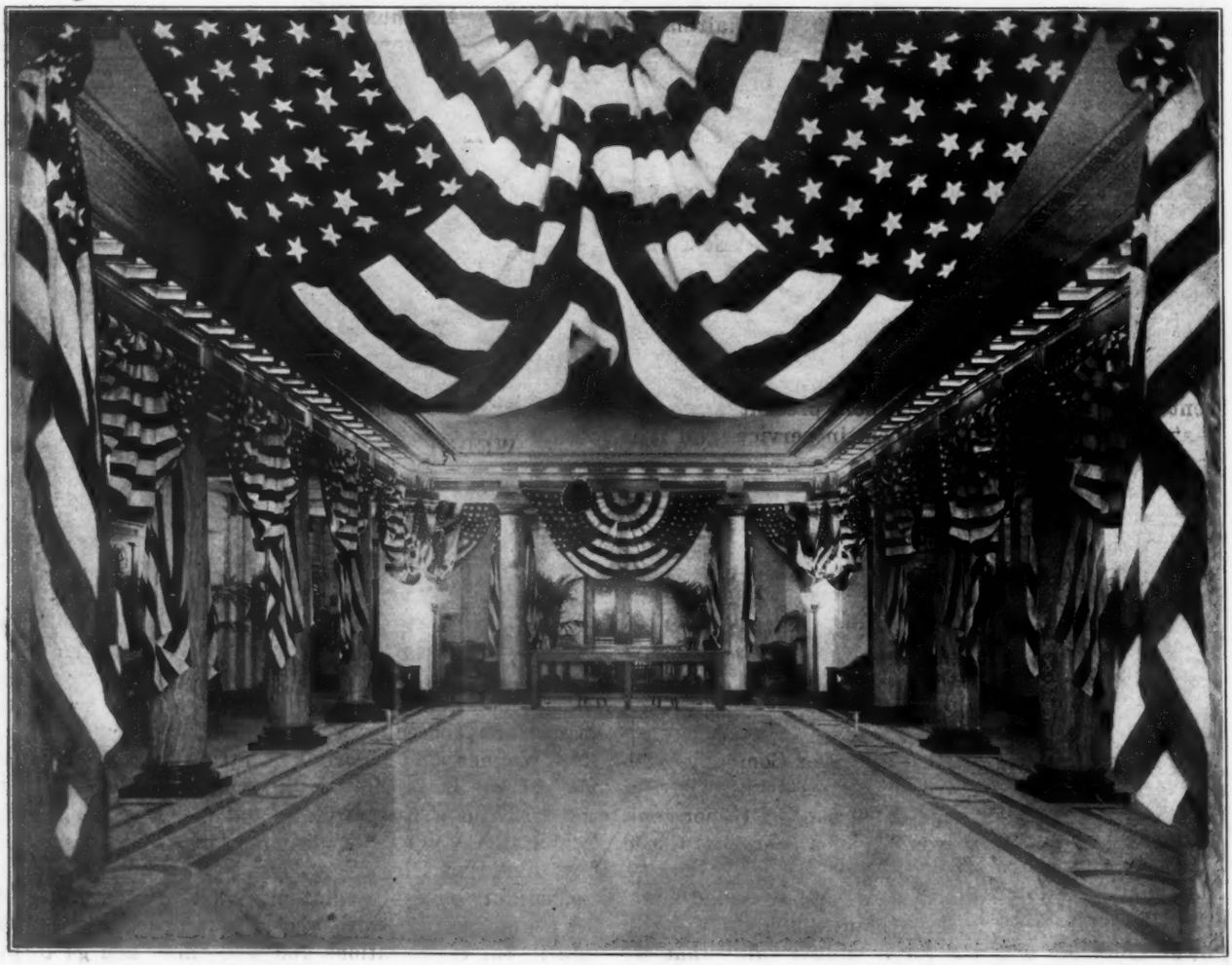
COAL AND FUEL

"We have already had an experience," said Mr. Lieb, "which it is unpleasant to recall—indeed, it is not a matter of recall, we are right in it now, and the end is not yet—and it is felt that there again such a committee as has been indicated will be of value in being the channel of contact with the United States government, under one of its committees, to see that coal is delivered regularly and in quantities that may be necessary. It is quite possible that the stress may become so great that it will be necessary to classify our business, to curtail the less urgent business and curtail our coal requirements."

PROTECTION OF PROPERTY

Mr. Lieb drew attention to the importance of protecting property and the responsibility of the companies in that respect as well as in rendering service.

An outline of the advantages and logical reasons



ENTRANCE HALL AND REGISTRATION DESK IN ENGINEERING SOCIETIES BUILDING, WHERE N. E. L. A. WAR CONVENTION WAS HELD

for close association with the gas industry was given by Mr. Lieb, to the end that the most effective coordination for government service may be assured. He mentioned the counsel and advice received from Alex Dow of Detroit and Prof. D. C. Jackson of Boston.

MAJOR J. H. FINNEY

Howard E. Coffin of the Advisory Council for National Defense was prevented by conditions in Washington from addressing the convention. In his absence Major J. H. Finney spoke of the organization in which Mr. Coffin ably fills so large a place. Major Finney said:

"Your first problem is to get and keep your house in order so that you shall not only meet present demands but shall take care of an almost overwhelming additional demand that will be expected of you in this emergency. How this is to be done is not my province to say, and I shall leave it in the most capable hands of my friend Lieb to discuss. But that it will be done and well done I am sure.

"But that is not enough to do, nor all that you can and must do, for it is up to this great organization as technical men and as employers of technical and skilled men to keep supplied the many thousands of skilled and trained men required by the army and navy—and to do this promptly and effectively at a time when you feel that your own organization must be kept intact."

PATRIOTISM AROUSED BY MR. ALDRED

In introducing J. E. Aldred, New York, chairman of the board of directors of the Consolidated Gas, Electric Light & Power Company of Baltimore, who has also large interests in Montreal and other places, President Wagner said that Mr. Aldred has the administration and control of 500,000 hp. Mr. Aldred created great enthusiasm by recounting the part of the Montreal company in caring for men who are at the front and giving his personal view that such men should feel that they and their dependents are provided for. Mr. Aldred spoke in part as follows:

"It is quite true at the outset of the war that practically every corporation in Canada came out with the proposition of paying the men who went to the front the difference between their present wage and what the government gave them in service, and it is also quite true that afterward that scheme was abandoned to some extent and its place was taken by what is known as the patriotic fund; but I may say from my personal experience and knowledge that it was not because the companies feared bankruptcy on account of the application of the first proposition. In fact, so far as the companies that I have anything to do with are concerned that cut absolutely no figure and would have been an impossibility.

MONTREAL COMPANY EXPERIENCE

"The Montreal Light, Heat & Power Company, with an average number of 1375 employees during the last three years, had an average enlistment of 10 per cent. At $1,000 a year each, or even $1,500 a year, that would amount to less than $200,000, and anybody who knows anything about the conditions of the so-called Civic Investment Company and the Montreal Light, Heat & Power Company will not for a minute think that we would have 'gone broke' on $200,000 a year, and that same thing applies to every other company that I have knowledge of in Canada.

"As a matter of fact, that was not the reason for the change at all. The change came about because while the corporations were still quite willing to carry out this proposition of paying their men their full wage minus what the government paid, the patriotic fund resulted from pressure from the agricultural sections.

"As a result of putting into effect this proposition of agreeing to pay our men, we not only stimulated enlistment, but we stimulated the efficiency of the force that was left at home, and we have not suffered by reason of losing as much as 10 per cent of the men. In fact, the efficiency has been maintained, and we have done 30 per cent more business than we ever did in any one year's history of the company.

"Now, it has been said in regard to this matter that the burden would be excessive on companies, and we are talking about companies in the United States. We have not found the burden excessive in Canada, and we furnished probably six men to every single man that will go to the front from the United States.

"That plan is still in effect, and it will stay in effect as long as the war continues.

SACRIFICE FOR THE CORPORATION

"I hope that there is an element of sacrifice to be met on the part of public service corporations. There certainly is going to be an element of sacrifice on the part of the mother that sends her son, and the wife that sends her husband, and I would feel ashamed to stand here now, speaking not as one only interested in the management of these corporations, but as one who happens to be in each case largely representative of the stockholders—I should feel ashamed if I felt for a moment that any consideration of that side of the question had anything whatever to do with my action in the premises. (Applause.)

"What we are trying to do at this time is to get men to the front, and we are not worrying about the men that stay at home."

A great outburst of applause followed Mr. Aldred's remarks, and Major Finney proposed three cheers for him, which were given heartily. The morning session was then adjouned.

WEDNESDAY AFTERNOON SESSION

At the afternoon session President Wagner referred to the plan for an evening meeting, which it had been hoped would be addressed by Herbert C. Hoover. Mr. Hoover was not able to leave Washington. Oscar T. Crosby, Assistant Secretary of the Treasury, was also unable to leave Washington. The result was the abandonment of the proposed evening meeting.

President Wagner spoke of the wide influence of the association.

"Before proceeding with the meeting this afternoon," Mr. Wagner said, "I think it fitting to emphasize the fact that this association has a wider influence and a closer touch with every city, town and hamlet in this country than any other association in existence.

"We will put patriotism before and above our more selfish interests in maintaining our profits, the question of providing for the dependents upon the men who are in our organizations and who enlist and go to the front. We will take as good care of the men that go to

the front as we do those employees who remain home, and that is a question we must consider carefully and thoroughly and in an unselfish and patriotic mood.

"In my position I hesitate to express any strong opinion on this subject myself, but we have had speakers this morning and we will have this afternoon who presented and will present both sides of the question, and I feel like saying to you that with all these different opinions we must hold patriotism and our duty to the country above everything else." (Applause.)

Chamber of Commerce Representative

Allen Walker, personal representative of the president of the United States Chamber of Commerce, spoke at length on the questions involved.

"Whether it be in regard to war taxation or in regard to this particular question of industrial payrolls during war time," he said toward the close of his remarks, "we have found throughout the country a determination on the part of business, not only to do its share and more than its share, but a voluntary offer to do its share regardless of personal results but with only one warning finger that is necessary to be uplifted, and that is 'Take care that you do not kill the goose that lays the golden egg,' because there never was a time in the history of this country when it was necessary for men to pay more attention to their business than right now, because if the business of the country slacks everything else in the country slacks in proportion and everything else suffers and the wheels stop, and unless you keep the wheels of the machinery of business going the whole problem of production is affected and your man at the front counts for a very negligible factor."

W. F. WELLS
Elected First Vice-President for the New Year

R. H. BALLARD
Elected Second Vice-President for the New Year

J. B. McCall

J. B. McCall, president Philadelphia Electric Company, said that he was in hearty sympathy of course with any project which this association or business men generally may adopt for the care of dependents of enlisted men. He added:

"I feel, however, that we ought to move carefully and practically; that the important thing is to so organize our own industry, in co-operation with others, that the wheels of business may continue.

"In our case we are practically the most vital industry in any community, and we ought to do our utmost. In connection with the sub-committee, I made the original proposition that if it was possible to impress upon the Council for Defense the formation of an industrial reserve that would in the beginning and as a foundation align our men in the interest of the government and of the nation, first, for whatever the nation might need, and, second, as a part of that need to continue the detail operations, conserving power and light in our communities, and as a step from that foundation for the man in charge of these various companies to make an inventory of the men, and to set aside first those men who are absolutely imperative under war conditions, which are likely to continue for two or three years, to the performance of service in a community, to keep a force that will enable us to supply all the power necessary in the manufacture of munitions and various other materials that are needed at the front.

"If we have the experience that they have had abroad, as I understand it, it would be practically impossible for us to get the means, either by issuing securities or otherwise, to make very large extensions. It is important that we make an inventory of our requirements in that direction and get right down to a war basis and apply that same method to everything that we have in connection with business."

L. A. Ferguson

L. A. Ferguson, Commonwealth Edison Company, Chicago, described a plan adopted by that company which is tentative to the extent that it is definite only until Aug. 1. This is based on the theory that the company shall not pay anything to the man himself who goes to the front, but that it shall provide for the dependents that he leaves at home.

H. I. Harriman, New England Power Company, said that that company is having an investigation made to see what it costs the various employees to live in New England, and based upon the results a list of payments to the wife and the children at home will be made up.

Experience in Toronto

D. H. McDougall, Toronto Power Company, said:

"In Canada the power supply companies have been taxed to their utmost to supply the demands for energy for their customers, many of whom are manufacturing munitions of war.

"Every kilowatt of energy is put to work and many overloads have been carried that were previously thought to be hazardous.

"The company I represent has increased its load since before the war by over 505 per cent and now delivers energy to munition plants of various kinds totaling over 60,000 hp.

"This munition business is an important factor in the country's contribution to the cause of justice in Europe. Men are needed for the manufacture of munitions in all its branches and none are so necessary as the central station men who operate and manage the power supply plants.

"In regard to the wage question, the Toronto company had a great deal of the same kind of discussion you are having, only we think a much more serious problem than you have to face under the selective recruiting system. We decided that it would be unfair and improper to do anything for our men except contribute to the organized patriotic fund. All our contribution goes to the patriotic fund administered by the government or local commissions."

Mr. Freeman presented a resolution expressing the sentiment voiced by the public policy committee report

SECTION CHAIRMEN WHO ARE CONTINUED IN OFFICE FOR ANOTHER YEAR

J. L. BAILEY

E. S. MANSFIELD

R. J. M'CLELLAND

E. A. EDKINS

in regard to the special committee on war conditions. After discussion the resolution, which is published on page 884, was adopted unanimously.

Speaking further on the subjects under discussion, Mr. Freeman added:

"I am inclined to think that we can in each case make it easy for men to go to the front, for the right men to go, for the men who can be spared, as is the case with all of us, and I feel so far as the organization for which I am responsible is concerned that I would rather err on the side referred to by Mr. Aldred this morning than on the other side. (Applause).

"I think these plans that have been suggested, the Chicago plan, the Philadelphia plan, should be amplified for our benefit by the committee as doubtless they will be, and I am sure that the sense of this meeting is that we shall not leave things in the air, that we shall not take the risk of being misunderstood in our motives by placing an undue amount of emphasis on the holding of the men that we must hold as against the proper amount of encouragement to the men whom we do not need to perform the work which the nation needs of them, and needs primarily at this time.

"I am sure that the committee will have that thought in mind as much as the other thought, and so far as my own organization is concerned, I want it to feel that we have the interests of the nation first at stake, and that when we are asking men to remain at their work it is not selfishness, but that it is patriotism, and that that patriotism must be divided properly as between holding sufficient men to man the organization, and releasing the men whose duty it is to go to the seat of war." (Applause.)

C. M. Cohn of Baltimore, W. B. Tuttle of San Antonio and Samuel Scovil of Cleveland also discussed the position of those who go to the front.

ENCOURAGE THE MAN, SAYS MR. SCOVIL

Mr. Scovil said: "The man who makes up his mind to lay down his life for his country wants all the encouragement to go to war that he can get. He goes because he considers it a duty to go, and I consider that every man who is allowed to stay at home should be thankful if he is in any way able to do anything, and he should consider it a great privilege that he is allowed to stay at home. Every man that is selected wants all the encouragement and enthusiasm put behind him that is possible, no matter how he is selected." (Applause.)

HELPING FOOD PRODUCTION

J. T. Hutchings, Rochester Railway & Light Company, said that Rochester manufacturers are not hiring men who have had farm experience and hope in that way to promote food production.

H. H. Ganser also spoke of the importance of aiding food production.

FINAL SESSION

President Wagner called the last session to order at 10.10 a. m. on Thursday.

Mr. Wagner read a telegram from Howard E. Coffin expressing deep regret that Washington business made his presence at the meeting impossible, and referring to the important and essential character of the service rendered by the companies.

SOUND FINANCIAL CONDITION

Mr. McCall, as chairman of the finance committee, read the report of the treasurer, W. H. Atkins, Boston, who was unable to be present. It showed that the association is in better financial condition than ever before, having increased its investment funds and having available the amount necessary for expenses during the rest of this year with a balance besides.

NOMINATING COMMITTEE AND OTHER BUSINESS

The nominating committee to name officers for the ensuing year was then appointed, as follows: Charles L. Edgar of Boston, chairman; Henry L. Doherty of New York, W. H. Johnson of Philadelphia, Douglass Burnett of Baltimore, and J. B. Miller of Los Angeles.

Walter Neumuller, New York chairman membership committee, said that the keynote of the report of that committee was that the 15,000 mark in membership had been passed.

President Wagner introduced the subject of the sections. W. H. Johnson offered the following resolution, which was passed:

"Be it resolved that no election be held at this meeting, and be it further resolved that the officers and committees of the four national special sections—to wit, the Technical and Hydroelectric, the Accounting, the Commercial and the Electric Vehicle Sections—be requested to continue in office until such time as their successors are elected."

It was decided that the papers and reports should be admitted to the *Proceedings* after submission to a

special committee composed of Secretary Martin and the chairmen of the various sections. The actual *Proceedings* of the special convention will be sent to Class A members at as early a date as possible.

Mr. Martin presented the report of the committee on memorials.

Frank W. Frueauff, in reading the report of the committee on constitution and by-laws, said that the work had been started and done largely by R. S. Orr of Pittsburgh, who died during the year.

President Wagner spoke briefly of the work of the safety committee.

Following this he gave an outline of the affairs of the exhibition committee.

Coal Situation

Mr. Wagner asked about the appointment of a committee in Washington on coal conditions.

Mr. McCall spoke of the appointment of the committee, of which F. S. Peabody of Chicago is chairman. He said that the situation was most serious. He suggested that the companies should inform themselves as to their needs so that if they are asked for definite information they will be ready. Mr. McCall also spoke of the necessity of financing capital requirements.

Financing Requirements

W. F. Wells, Edison Electric Illuminating Company, Brooklyn, recalled the Association Island address of Frank A. Vanderlip, and compared the enormous requirements of the government through the "liberty loan" with the normal demands of the great public utility industries. He counseled conservatism in expenditures which may be omitted.

Van Dusen Rickert, Pottsville, Pa., followed Mr. Wells.

John H. Roemer, former chairman, Wisconsin Railroad Commission, said that he thought the question of capital was serious. The industry cannot stand still. If it only keeps up with the normal increase in business without making extensions it will require a great deal of new capital. It behooves every company to provide for its capital requirements while it can do so.

Henry L. Doherty, Cities Service Company, said that the most serious question was that of getting capital for extensions. Mr. Doherty suggests that the government issue scrip as well as bonds to represent the new large obligation. This would help to develop a new class of investors among those who had not bought securities heretofore.

The Situation in New England

H. I. Harriman, New England Power Company, said that the coal situation was the most serious one which faced the companies in New England. The increase in cost at the mine and the difficulties of land and water transportation to New England coast points made the consideration of this question a vital necessity. If attention is not given to it soon and it is allowed to drift until cold weather there will be a grave crisis, at least in New England .

E. A. Barrows, Providence, R. I., and Mr. Edgar spoke of the coal situation.

Mr. McCall presented the report of the committee on the annual address of the president. One point in this report follows:

"The increasing cost of material, fuel and labor is a question that has been brought home to all our members and they should very carefully consider the effect of these changes of their rate schedules, recognizing the importance of maintaining their present rates for the smaller user, and in cases where it is evident that a raise in rates is necessary, the burden of this change should be made to fall on the power user who most frequently enjoys the benefit from lower rates."

Report of Nominating Committee

Mr. Edgar presented the report of the nominating committee, as follows:

President, J. W. Lieb, New York Edison Company; first vice-president, W. F. Wells, Edison Electric Illuminating Company of Brooklyn; second vice-president, R. H. Ballard, Southern California Edison Company; third vice-president, Samuel Scovil, Cleveland Electric Illuminating Company; fourth vice-president, D. H. McDougall, Toronto Power Company; treasurer, W. H. Atkins, Edison Electric Illuminating Company of Boston; executive committee, Paul Spencer, United Gas Improvement Company; Walter Neumuller, New York Edison Company, and E. W. Lloyd, Commonwealth Edison Company of Chicago.

The secretary was instructed to cast a ballot for the nominees.

Mr. Lieb, in expressing a sense of the obligation which he assumed in accepting the office, particularly at this trying moment, said that he would invite and urge the co-operation of the smaller companies in the work of the organization.

The convention then adjourned.

Appropriateness of Mr. Lieb's Election

Mr. Lieb is particularly well fitted to serve as a war president of the N. E. L. A. He has thrown himself with his customary vigor and earnestness into the work of preparedness. In addition to the chairmanship of the special N. E. L. A. committee he is a member of the Mayor's committee on national defense of New York City, a member of the executive committee of the military engineering committee of New York, a member of the committee on national defense of the American Institute of Electrical Engineers and vice-chairman of the citizens' protective committee of New Rochelle, N. Y., where his home is located.

Born in Newark, N. J., on Feb. 12, 1860, Mr. Lieb was graduated from Stevens Institute of Technology in 1880. His early work in this country, subsequently in Italy and then in New York City, is well known. Vice-president of the New York Edison Company, he is also president of the Electrical Testing Laboratories and is connected with other companies.

Mr. Lieb has always been an active supporter of the progress of the societies in the industry. He is a past-president of the American Institute of Electrical Engineers, the Association of Edison Illuminating Companies and the New York Electrical Society. For his achievements in Italy he was decorated by the King of Italy with the order of Knight Commander of the Order of the Crown of Italy. His many activities, intense as they have been, have been confined largely within the one industry to which he has devoted his life.

War Convention Address of President Wagner

Central Station Companies Face Problems of Man Supply and Fuel Supply and Great Demand for Power from Munitions Industries

PRESIDENT WAGNER'S address to the convention dealt partly with general association affairs, but mainly with the questions arising from the war. His address in part follows:

REGULATION AND PROFIT

"We have welcomed and encouraged regulation by public service commission as the best means of assuring the fair consideration of rights involved and supplanting the wasteful and inefficient regulation by competition, involving, as it did, the duplication of capital and effort and the subdivision of sources of supply. Experience has proved what theory had always maintained, that concentration of capital, effort and production is the only means of realizing the lowest costs and, with proper regulation, the lowest selling prices.

"The public has been slow to appreciate the full significance of this economic truth, but as those engaged in the public service have learned to realize more fully their duties to the public, the people have also begun to understand to some extent their dependence upon and duties to the public utilities. In bringing about this better understanding the N. E. L. A., through its co-operative and educational methods, has played an important part.

"Under wise public service commission regulation ample profit must result in constantly improved and extended service and lower rates. In any business lower prices for the product can be brought about only by better methods of production and management and by increased volume of production and sales.

RETIRING PRESIDENT H. A. WAGNER

"Some incentive is required, however, to make such improvement appear desirable to the management and owners. This incentive is usually found in the hope of greater profit. The public service business needs this same incentive for improvements and expansion which will make lower prices for service possible. If rates are continually being lowered, with no increase in profits, all incentive to adopt methods to lower operating expenses will naturally cease.

"Some fair division of excess profits between the consumers and the companies is therefore essential to assure the best results for the consumers. Reductions in rates, without the attendant possibility of increased dividends, are not only unfair but prejudicial to the best interests of the public. The consumers are dependent upon the public service company, and the company is dependent upon the consumers. The relation of the two should really resemble a partnership for mutual benefit. Their interests are not opposed, but actually interdependent. Neither should seek to reach for all the benefits, for they would be of short duration.

"With the view of making this mutualization of interest more effective on a profit-sharing basis, a number of our larger public service companies today are encouraging their consumers and employees to invest in the company's securities, and these efforts are meeting with very satisfactory results.

GEOGRAPHIC SECTIONS

"The latest development in geographic section organization is the proposal to admit as geographic sections those existing state and other associations having both electric company and gas company members, in which the electric companies that are members of the N. E. L. A. are in the majority.

NATIONAL CONVENTIONS

"For some years there has been a growing feeling among many of our members that the national conventions are becoming too large and unwieldy and an increasing burden upon member companies for loss of time and increased expense in attendance of so many of their busy men. The greatly curtailed and limited annual meeting which has been called this year to take the place of the usual form of annual convention may serve as an object lesson to illustrate practically both the advantages and disadvantages of a limitation of attendance at annual conventions. The growth of the geographic section idea and the multiplication of the conventions held by these sections must further modify the consideration of the possible future and character of national annual conventions.

OPPORTUNITIES OF THE CENTRAL STATION

"The dependence of the public upon the service of electric central station companies has been demonstrated

more clearly than ever before, and the growth of the demand for central station power, on the one hand, and the decadence of the isolated plant, on the other, have been unprecedented. There are before us to-day greater opportunities for the extension of our power service and for the practical elimination, through obsolescence and inadequacy, of all other sources of power for the country's industries, great and small, than the greatest optimist could have dreamed of a few years ago. In grasping these opportunities we are only limited by our ability to finance our unprecedented requirements, by the increasing difficulty of obtaining deliveries of apparatus and supplies, and by the greatly increased cost for all equipment, which may become well-nigh prohibitive without an increase in rates for service.

PREPAREDNESS FOR WAR

"Some fear has been expressed in this country that a general impulse for economy might suddenly contract the volume of business to such an extent as to disorganize industry, throw wage-earners into idleness and create a general state of alarm and confusion which would seriously impair the ability of the country to deal with the great emergency which confronts it. Many are urging that it is better for each person to go ahead in his accustomed way and with his usual expenditures than to run the risk of disturbing the orderly movement of trade by encouraging a general change of pace. It seems to be generally agreed, however, that there will have to be material changes in our industrial methods and a reduction of expenditure.

"But these changes should come about gradually and automatically, as government orders are given preference over private orders, by the effect of high prices, by the influence of taxation and by the patriotic desire to participate in the war loans. It is imperative that in all these readjustments we avoid hysteria and impulse.

INDUSTRY DEPENDENT UPON CENTRAL STATIONS

"It is safe to say that there is to-day no class of industry, no kind of manufacturing enterprise, which is not dependent upon electric central stations for power or light, or both. Within the last two years the expansion of factories and mills engaged in the production of munitions for war and the various materials used for their manufacture has resulted in greatly increased use of central station electric power.

"Light for our streets and homes provides the most effective protection and security against all forms of disorder and crime which the unsettled conditions may encourage.

"In order to maintain our service with undiminished effectiveness it is, of course, necessary that the public utilities should retain at least the greater part of their forces of skilled men, and prompt measures must be taken to offset the effect of enlistment and the application of the selective draft in decimating our organizations. We must find ways and means of holding the bulk of our men in their present jobs without discouraging enlistment or in any way embarrassing the government in raising the required military forces.

"It is most desirable for us also to consider what position we are to take in contributing toward the support of those dependent upon our employees who enlist or who are drafted. Undoubtedly, our inclination is to be liberal in our contributions, but, on the other hand, the limitations of our financial resources, particularly in view of the great increase in the cost of fuel and supplies and the possibility of curtailed earnings, must warn us to pause before taking precipitate action which we may afterward be forced to modify.

"One of the most serious problems which confront us is the scarcity of fuel, or the means to assure its delivery in such regular quantities as our requirements demand. Some prompt and well-organized action must be taken to bring before the proper government authorities the extreme urgency of the adoption of measures to put public utilities in a preferred class for fuel supply.

"Without doubt our central station companies will be called upon for increased service for many industrial purposes in connection with government contracts for munitions and supplies, and this possibly without a proportionately diminished demand for the usual commercial and domestic service. With the slow deliveries of equipment and apparatus for extensions, and the possibility that available supplies may be commandeered by the government, we are faced with the possibility of increased demand upon our output beyond our capacities to supply.

"In such a contingency we will undoubtedly be forced to give preference to government requirements, and this may bring before us questions of discrimination which will present difficult problems in themselves and will, no doubt, call for relief through federal enactment.

"Another urgent question confronting us is the necessity and obligation of protecting our properties against interference, damage or destruction by the hands of fanatics, enemy agents and mobs. The extent to which such protection is desirable or feasible and the best means of securing it, considering both the urgency and expense, are matters upon which there are widely diverging opinions and counsel."

PRESIDENT WAGNER REVIEWS THE YEAR AND WAR PROBLEMS

By the campaign of the active membership committee the total enrollment has passed 15,000 for the first time, standing at 15,057, divided between 1134 Class A members, 12,715 of Class B, 95 of Class C, 245 of Class D, 831 of Class E and 37 foreign.

Particular attention was called to the great value of educational work for employees of member companies.

Mr. Wagner impressed upon his hearers these important points:

"Some fair division of excess profits between consumers and companies is essential to assure the best results for the consumers."

"The dependence of the public upon the service of electric central station companies has been demonstrated more clearly than ever before."

"There is more work in sight than ever before, and expenditures will not be lessened but will merely be shifted to new channels."

"Public utilities are standing behind the supply of the various sinews of war, and it is of paramount importance that service should be continued with undiminished efficiency and reliability and even extended where necessary."

Business of Country Must Go On

Society for Electrical Development, at Annual Meeting, Pledges Support to Movement Which Will Prepare Electrical Systems for Added Demands Brought by War—Organization of the Industry

ACTIVE support of the nation in the preparation of all electrical systems for the added demands brought by the war was pledged by the Society for Electrical Development at its annual meeting in New York, May 8, by the following resolution:

> Whereas the President in a proclamation to the people of the United States has urged the conservation of all resources and the devotion of all energies to the sole purpose of bringing victory to the arms of the nation in the war upon which it has so justly entered;
>
> Resolved that this society, at its annual meeting, pledges to the President its patriotic support of all measures which he may take in upholding the dignity and honor of our country and the rights, property and persons of its citizens on land and sea;
>
> Resolved that America's success in helping to win this war depends not alone on its ships or its food supply, but first of all upon our ability to keep the wheels of mercantile business going.
>
> Resolved that the business of this country must go on, and we pledge our active support to the movement by which every business man in this country agrees to hold up his link in the chain of mercantile enterprise, including the preparation of all electrical systems for the added demands, both military and industrial, which may be made upon them.

In line with its resolution the society is mailing a poster to its members which bears the following:

BUSINESS *MUST* GO ON

> America's success in helping to win this war depends not alone on its military forces, or its ships, or its food supply. It depends, first of all, on our ability to keep the wheels of mercantile business going. In the months to come will be heard all about us the grumble of the pessimist. It will be said that trade is slackening, that there are food famines, coal famines, freight congestion, labor shortage, business stagnation. Those will be the days for the electrical industry to stand together as one man, and boost for prosperity.
>
> We must be up and doing! We must co-ordinate and concentrate to push business. We believe that business must go on. We believe there are strong, optimistic men enough in the business fabric of this nation to keep it going! This republic has been built up through faith in itself.
>
> This is not our first crisis. In other years men have fought side by side to save many a situation in business and in war, because they believed in each other. Confidence in ourselves, plus "Yankee ingenuity," have given to this nation an ability possessed by no other on the face of the globe—the ability to land squarely on our feet in any upheaval.
>
> We of the electrical industry look to these days as our supreme opportunity to make good business better. We believe that as never before people are coming to recognize electric service, appliances, motors as economic necessities of home, workshop, store, office and farm. We pledge our active support to the movement by which every business man in this country agrees to hold up his link in the chain of mercantile enterprise. The business of this country must go on. Will you help?

To aid in organizing the industry a committee was appointed composed of A. K. Baylor and W. A. Layman, representing manufacturers; J. R. Strong and Ernest McCleary, representing contractors; W. H. Johnson and J. E. Montague, representing central stations; W. E. Robertson and Fred Bissell, representing jobbers, and James H. McGraw, chairman.

The committee is thus composed of two representatives of each interest in the electrical industry. These two men constitute a sub-committee, the duty of which is to ascertain what their particular branch of the industry wishes the Society for Electrical Development to do for them. Having ascertained this, a meeting of the committee on organization of the industry will be held at the offices of the society on May 29. This committee will then discuss the various suggestions and formulate plans to be submitted at a meeting of the board of directors of the society which will be held shortly after that date for the purpose of receiving, considering and acting upon the suggestions made by this committee.

OTHER BUSINESS TAKEN UP

Among other things taken up at the meeting was the annual report of J. M. Wakeman, general manager of the society, who reviewed the work of the year and set forth the plans for the coming year, including the publication of a number of new booklets for the use of salesmen, business managers and others in the industry.

The report was received with considerable enthusiasm and was commented upon most favorably by all present. Particular reference was made to the good work done in securing the publication of articles in the popular magazines bearing upon the uses of electricity. James H. McGraw, who presided as chairman at the request of President H. L. Doherty, said if the Society for Electrical Development did nothing else for a year but continue its good and unique work in educating the public through the magazines, daily papers and trade press it would justify the expenditure of all the money it collects. He added: "The society is the only organization in the electrical industry in a position to do this valuable and very necessary work."

The treasurer's report showed very satisfactory collections of subscriptions. Only 4 per cent of the subscriptions due up to March 31, 1917, have not yet been collected. The general manager's and treasurer's report will be printed and distributed to the industry later by the society.

The following directors were elected for the ensuing four years: Henry L. Doherty, A. W. Burchard, W. E. Robertson and Ernest Freeman. The board of directors held a meeting in the afternoon at which the following officers were elected for the ensuing year; President, Henry L. Doherty, and vice-presidents, W. H. Johnson, A. W. Burchard, W. E. Robertson, J. Robert Crouse and Ernest Freeman.

The members of the executive committee were appointed as follows: Chairman, W. H. Johnson; Henry L. Doherty, Ernest Freeman, A. W. Burchard, J. Robert Crouse, W. E. Robertson, L. A. Osborne, Gerard Swope and J. R. Strong.

The general manager and the secretary-treasurer were reappointed for another year.

N. E. L. A. Convention Papers and Reports

Abstracts of Principal Technical, Commercial, Vehicle and Accounting Section Committee Reports Prepared for the Annual Convention but Presented Only by Title at Special Meeting in New York

THE annual convention of the National Electric Light Association, scheduled to be held at Atlantic City the last week of this month, would, so far as could be gaged by preparations made for it, have eclipsed every other convention of the association. Unfortunately, because of the problems arising from the war, it had to be abandoned, and to comply with the constitution a special meeting was held in New York City on Wednesday and Thursday of this week.

Reports of all committees have been prepared, and abstracts of as many of them as were available for publication on going to press are presented in the following pages.

TECHNICAL AND HYDROELECTRIC SESSIONS

MOST prominent among the technical reports for amount and character of information presented is the report of the committee on prime movers. Among the principal subjects discussed were the tendencies in development and problems involved, feasibility of higher steam pressures, superheats and velocities, and solution of hydroelectric-plant ice problems. Four other reports and two papers were presented on electrical apparatus, underground construction, inductive interference, meters, the metric system, and working on high-voltage lines. Up to the time the convention was held no other reports or papers had been submitted. The electrical apparatus committee's work was principally the revision and extension of transformer standards and the further introduction of the uniform service rules for motors. A treatise on the handling and care of transformer and switch oil represented a valuable part of the report. Cable specifications and a method of making split-conductor joints constituted an important part of the report on underground construction. The chief subject discussed by the committee on overhead lines was the problem involved in mitigating interference with ground-return telephone lines. Acceptability tests and methods of maintaining meter accuracy formed the principal part of the meter report.

POWER PLANT EQUIPMENT AND PRACTICE

Prime Movers

For wealth of material and thoroughness with which each subject was covered, the report of the prime mover committee, of which J. M. Graves is chairman, is especially important. Reports from manufacturers on tendencies in development, problems involved in design, relative volume of business, etc., make up the greater part of the report. Experiences of operating companies in various lines are also included. Among the subjects taken up are turbines, condensers, station auxiliaries, stokers, refractory materials, coal handling and storage, weathering and spontaneous combustion of coal. Feasibility and practicability of higher steam pressures, condenser cleaning, economical steam velocities and pressure drops, station instruments, analysis of power requirements of station auxiliaries and treatment of boiler-feed water are also discussed and comments made regarding Diesel engines, progress in water-power development, operation and maintenance of hydroelectric stations, ice-handling methods and waterwheel testing.

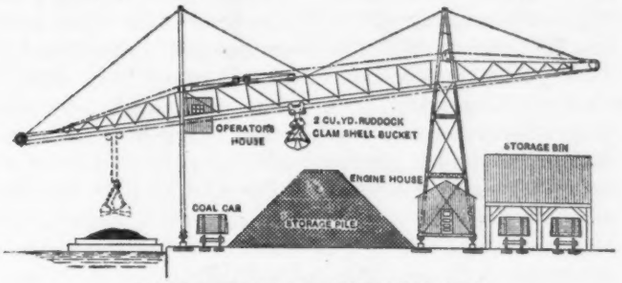
Practically all manufacturers report a phenomenal increase in volume of business compared with previous years. There has been a great increase in the number of orders for large prime movers, the development of large

LOCOMOTIVE CRANE USED BY INDIANAPOLIS COMPANY

condensers, boilers, stokers and auxiliaries keeping pace with the development of the turbine. At the same time there has been an enormous demand for units of moderate size. The largest turbine so far developed is rated at 70,000 kw. and the largest condenser on order has 100,000 sq. ft. (30,480 sq. m.) of surface. Many industrial plants are now installing units rated at 10,000

kw. and 15,000 kw., whereas 2000 kw. or 3000 kw. was considered large before. Some of the most recent tendencies are toward the use of higher steam pressures and superheats, several plants now under construction having been designed for 300-lb. (21.1-kg.) pressure and superheat of 200 to 250 deg.

Turbines, Condensers and Auxiliaries.—When it is



GANTRY CRANE FOR HANDLING COAL

considered that about 76 per cent of the energy theoretically obtainable from steam expansion may now be realized at the switchboard, not much greater gain in power-house economies is to be obtained through further development of the turbine and its generator, according to the Westinghouse Electric & Manufacturing Company. Progress is to be looked for in other channels, higher pressures being one method.

The tendency in regard to circulating pumps is no doubt in the direction of more water per pound of steam. With steam-turbine drive, the general trend is toward higher turbine speeds. Development work during the past year has been along the lines of adapting the underfeed stoker to high-ash Middle Western coal and to lignite, both of which are now being handled with entire satisfaction. Particular attention has been given to dumping, the double dump gate being used satisfactorily with each fuel. In large plants the tendency is toward the use of higher rated boilers, 1000 hp. becoming standard equipment in the larger plants.

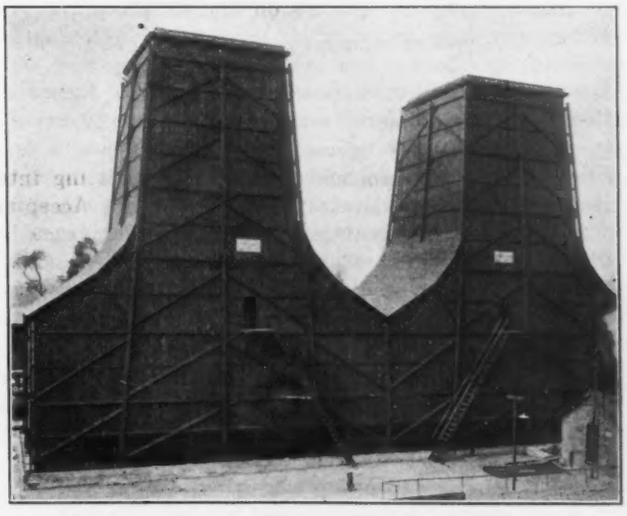
The Sanford Riley company repeats its prediction of 1916 that further developments in combustion efficiency will be obtained by feeding fuel slowly through the retorts and by providing for large volumes of coal in the furnace. These conditions may be obtained either by installing stokers back to back or by making the retorts extra large.

Firebrick Problems.—Owing to the increased rating of boilers, the firebrick surfaces have been proportionately increased, and the higher temperatures have produced greater expansion and contraction in them, so there are more frequent failures in both arch and side walls. Various methods have been tried to strengthen the flat walls, but with little success. Buttresses built inside of the combustion chamber were burned off in a very short time. Sheet-iron linings were also tried, but were melted down as soon as the firebrick inside had been burned away or partly destroyed by slag.

Developments in the standardization of methods of testing clay brick have been made during the past year. Modifications of tests recommended by C. E. Nesbitt and M. L. Bell in a paper before the American Society for Testing Materials have been included by the prime-mover committee in this year's report. Some of the subjects taken up are abrasion, slagging and softening tests, expansion and contraction, wall construction, heat insulation and airproof coatings.

Coal-Handling Methods.—Since the early fall of 1916 the delivery of coal has greatly hampered the operation of public utilities, so means have had to be provided for adequate storage to meet such contingencies. For this reason the prime-mover committee has outlined a number of methods of storing and handling coal. The ordinary mast and gaff arrangement is inexpensive and efficient when rapidity of handling and maximum storage are necessary. The traveling cableway is more efficient so far as utilization of ground area is concerned, but is slow in stocking and reclaiming where long travel is necessary. Many types of gantry cranes are employed, the choice usually being determined by the space available and the desired method of power operation. Locomotive cranes are extensively and efficiently used for rehandling, stocking and reclaiming, either by direct delivery or by means of belts or cable-car hauls. Combinations of the unloading tower and traveling bridge, fed either by electrically operated towers or by cable cars, utilize to the largest extent the ground area available, give maximum storage, and usually permit maximum speed with minimum labor for both stocking and reclaiming. For small installations an electrically operated bucket carrying its own motor is practicable.

Considerable data on the storage, weathering and spontaneous combustion of coal have been collected by the committee. The results show, in the case of the New River coal, a loss of less than 1 per cent in calorific value in a year by weathering in the open. The greatest loss was 1.85 per cent in two years. Practically no loss was observed in samples submerged for one year in fresh or salt water. There was almost no slacking of lumps in the run-of-mine samples. In all tests the crushed coal deteriorated more rapidly than the run-of-mine. Pocahontas run-of-mine coal in a 120-ton (108.8-metric ton) pile lost less than 0.4 per cent of its heating value during a year outdoors and showed little slacking of lumps. Gas coal suffered practically no loss of calorific

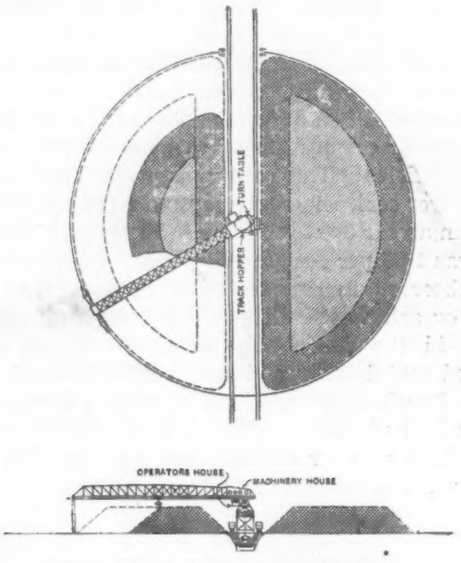


MAMMOTH COOLING TOWER (7500 GAL. PER MINUTE)

value in one year's exposure. Wyoming coal deteriorated 5.3 per cent during storage for two and three-quarter years and more than 2.5 per cent in the first three months. The committee points out that bulletins issued by the University of Illinois Engineering Experiment Station and the U. S. Bureau of Mines are well worthy of study in connection with this subject.

Higher Steam Pressures and Superheats.—Considerable of the prime-mover committee report was devoted to a discussion of the feasibility and practicability of using higher steam pressures and superheats. While many manufacturers admit that it is entirely feasible to design a commercial boiler for 500-lb. or 600-lb. (35 kg. to 42 kg. per sq. cm.) pressure, many manufacturers and engineers contend that the economy in water rate brought about by using higher pressures will be offset by the higher cost of apparatus and by operating difficulties. On the other hand, a representative of one manufacturer says that the theoretical gain of about 13 per cent of the present fuel consumption, which corresponds to an increase in steam pressure of 200 lb. to 600 lb. (14.6 kg. to 42 kg. per sq. cm.) without increasing the temperature of the steam, would, even if only partially realized in practice, fully justify the considerable extra investment in high-pressure apparatus.

Looking at the use of higher steam pressures from an insurance viewpoint, S. F. Jeter, chief engineer of



PIVOTED BRIDGE FOR STORING COAL

the Hartford Steam Boiler Inspection & Insurance Company, says: "Mere increase in pressure would not in itself be a great menace to safety, because it is a simple matter to build boilers of any required strength. However, there is no doubt that the strains produced by expansion and contraction will be greatly increased by the use of higher pressures and superheats. Another factor to be considered is the increase in stored energy. A cubic foot of water at 100-lb. (7 kg. per sq. cm.) pressure contains 812,000 ft.-lb. (110,500 m.-kg.) of energy available for the destruction of surrounding property when an explosion occurs. At 500-lb. (35 kg. per sq. cm.) pressure the same amount of water would contain 2,344,340 ft.-lb. (321,000 m.-kg.) of energy."

The Edge Moor Iron Company points out that the life of high-pressure equipment and its maintenance must be considered. With smaller drums and smaller tubes the water content per unit of output will be increased, therefore the fluctuations of pressure will increase, according to the Badenhausen Company. In addition, there will be an increased expense for purifying boiler-feed water. Expansion troubles both in the boiler and piping will be greatly increased, and there will be more difficulty in keeping the setting tight. Owing to the higher temperature of ebullition the stack gases will have a higher temperature, consequently economizers will be necessary.

At exceedingly high pressure, say 600 lb., with comparatively low superheat of 100 deg., serious windage and friction loss will occur in the high-pressure stages of the turbine, according to R. J. S. Pigott. Reducing the superheat will advance the dew point well into the high-pressure stages, resulting in losses with which every one is familiar. With the increased density produced by high pressures the eddy losses are bound to be greater than at lower pressures. New designs of expansion joints seem essential. Frederick Sargent of Sargent & Lundy, who has great confidence in the economy that will eventually result from the high initial working temperatures, says that the high initial temperature is not the only line of advance. Raising the average temperature is equally beneficial. This can be done by superheating the exhaust from the high-pressure end of the turbine before it enters the low-pressure end. Samuel Insull says: "It is not at all beyond the range of possibility that eventually, and indeed in our own day, we shall be operating steam turbines with the aid of boilers carrying as high as 1000 lb. (70 kg.) pressure."

W. D. Ennis points out that thermodynamic considerations favor high initial pressure rather than high superheat. However, high superheats are necessary with high pressures in that the frictional losses in the turbine are proportional to the density of the steam. Again, with fixed exhaust pressure, the expansion of dry steam leads to greater liquefaction, as the initial pressure is greater. Moisture will cause friction and wear may be the source of danger. The Babcock & Wilcox Company is conducting a series of experiments to determine the practicability of constructing boilers designed for 500 lb. to 600 lb. (35 kg. to 42 kg. per sq. cm.) pressure.

In the opinion of the prime-mover committee 300 lb. (21 kg. per sq. cm.) pressure and 200 deg. Fahr. (93 deg. C.) superheat, or an equivalent total temperature, is about the practical limit until further developments have been made and higher-pressure boilers have been successfully tried out.

Cleaning Condensers.—Several methods of cleaning condensers were outlined in the report. Arrangements can be made so that the circulating water may be reversed in direction through the tubes and any deposits tending to block the tubes thus removed. Some companies have allowed ground cinder and flue dust to go through the condenser tubes with the circulating water to remove deposits. The most common method of removing accumulations of mud and slime consists in washing out each tube with a stream of water under high pressure. Another method, which is more effective but which requires considerable time, consists of shooting leather disks through the tubes with compressed air. Bristle, wire and fiber brushes as well as steel plugs surrounded by helical steel springs are also employed. Baking the conductor tubes with steam is effective, but care must be taken not to dry out the tube packing. With this method the accumulation on the inside of the tubes is dried so that it peels off and can be washed out with the circulating water. Sand blast may also be used, but erosion must be guarded against.

Steam Velocities.—The advisability of increasing steam velocities in pipings and fittings and the conse-

quent increased pressure drops were discussed at length. Velocities as high as 7500 ft. (2286 m.) per min. are being allowed and authorities are advocating those in excess of 10,000 ft. (3048 m.) per min. The higher steam velocities permit the use of smaller steam pipes, which means greater flexibility and decreased maintenance expense. The fact should not be overlooked, however, that with a fixed pressure at the prime mover the excessive pressure drop in the fittings and piping may result in such high pressure at the boiler that the cost at this point may be materially increased. The greater the loss in pressure between the boiler drum and the steam header, the greater the difficulty in regulating the supply of feed water, since when the maximum quantity of feed water is required a minimum pressure difference exists, and vice versa.

Instruments.—Comments were made on the suitability of various boiler-room and engine-room instruments. Flue-gas thermometers and pyrometers comprise one class of temperature-measuring instruments which does not seem altogether satisfactory. Regarding steam-flow meters it was pointed out that the absolute accuracy of these instruments, although desirable, is not necessary, a relative indication being sufficient to warrant their installation. The most popular feed and condensate water meters seem to be V-notch type. CO_2 recorders have the objection that they are too delicate and require too much attention. The fixed relation between vapor pressures and temperatures regardless of atmospheric changes gives the thermometer the preference as an indicator of steam pressure or vacuum, as it is not affected by such changes.

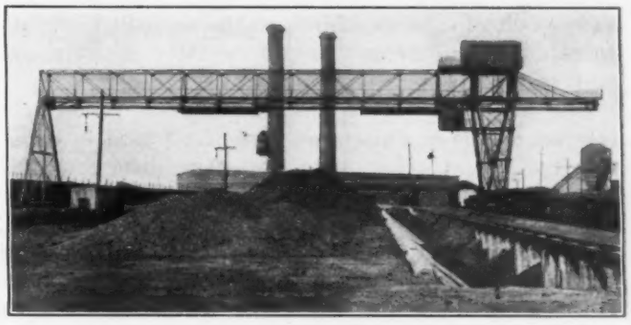
Methods of analyzing the power requirements of station auxiliaries using either steam drive or motor drive were outlined, a very interesting and valuable graphical method being presented. From the scheme outlined it is possible to select the auxiliary drives so that the heat balance will be maintained at all loads.

Some general remarks were made regarding the treatment of boiler-feed water, and information was presented on the methods of treatment used by different operating companies. With some feed waters, particularly in plants equipped with surface condensers, the most economical method of treatment is to feed the required reacting agent directly into the heater or feed line. Some of the new large central stations which use surface condensers are being equipped with evaporator systems. It is advisable in the case of any plant which does not employ a chemist to send samples of its boiler-feed water to boiler insurance companies or the State college for analysis and recommendations for treatment. A number of companies use the continuous soda-ash treatment, others filter the water through sand, and still others use lime, barium hydrate and iron sulphate, barium hydrate with soda ash, trisodium phosphate, soda ash and caustic soda, or the intermittent lime and soda-ash process. The cost varies from 3 cents per 1000 gal. to 10 cents (0.79 cent per 1000 l. to 2.64 cents).

The installation of large Diesel engines has increased remarkably during the past year, owing to the general rise in the cost of all fuels and the need of more motive power in the expansion of industries. The committee includes a résumé of the fuel-oil situation, pointing out the oil production of each oil-producing state for 1915 to 1916.

Water Power.—Owing to the rapid and general increase in power demands on central station systems and the increased cost and scarcity of fuel, there has been a resumption of activity during the past year in the construction of new hydroelectric plants and the extension of many existing systems. While most of these installations are of moderate capacity and medium heads, there have been a number of units installed of remarkable size. The single-runner scroll-case vertical-shaft turbine, using Francis-type runners and Kingsbury thrust bearings, has been generally adopted for new work. For heads of 80 ft. (26.7 m.) or more there is a tendency to use steel-plate or cast-iron casings owing to the difficulty of securing adequate reinforcement where scroll cases are very large. Efficiencies in the neighborhood of 93 per cent are being obtained. More care is being given to the design of intake and penstocks and to decreasing the losses in the draft tube and tailrace. Corrosion of waterwheel parts is most effectively prevented by removing the gate-rigging mechanism and moving parts to the outside of the turbine case. Erosion may be reduced considerably by eliminating eddies and cross currents.

Ice Problems.—Over nine pages of the prime-mover report were devoted to an extensive discussion by J. A. Walls on how to protect against different forms of ice, including frazil and anchor ice. It was pointed out that if the first formation of frazil ice is not quickly observed, the ice will accumulate so fast that shutdown cannot be avoided. The formation of frazil ice should be looked for during cold weather and high winds when there is no protective ice coating over the lake. Anchor ice is formed on cold nights when there is no ice covering on the pond or only a thin sheet of clear ice. One means of detecting the onset of frazil or ground ice is to immerse a chain in the flowing water of the forebay and examine it every half hour or oftener. Frazil or anchor ice cannot form until the temperature of the water drops to freezing, so a graphic thermometer will in many cases serve as a warning against any danger that may threaten from this cause.



COAL-HANDLING CRANE AT CLEVELAND PLANT

Some of the protective features to be considered in guarding against ice are as follows: Inclose the gate-house and provide for heating it; warm the exposed metal parts of the screen; watch the guide vanes and runners of the small waterwheels as they collect ice before the larger ones; warm the metal parts of the waterwheels and generators by blowing warm air against them or otherwise; arrange for injecting steam into the turbine wheel-pit in case ice adheres; keep reserve units heated up with steam, and avoid allowing cold air to enter the wheel pits before water is admitted to them.

DEVELOPMENTS IN ELECTRICAL APPARATUS

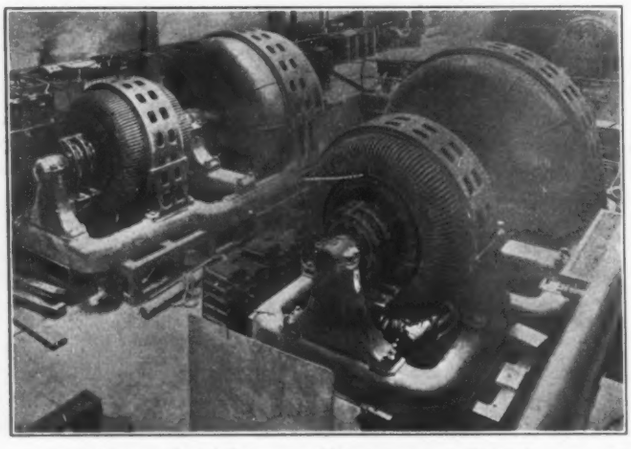
ELECTRICAL APPARATUS

Again the committee on electrical apparatus, of which G. L. Knight is chairman, emphasizes its belief in the importance and value of standardization with respect to electrical apparatus used on central station systems. The most important work done along these lines this year has been the revision and extension of the transformer standards presented to the association last year. The standards are representative of the needs of the whole country and should be of real service to the industry, the committee reports.

The question of standardizing the impedance of distribution transformers was discussed at length during the year, and as far as the electrical apparatus committee is concerned was settled for the present by the decision that it is undesirable to hamper the satisfactory development of the art by standardization of this characteristic. However, it is recommended that manufacturers indicate the impedance on the name-plates of the transformers to permit proper selection of units for multiple operation.

One feature of the report is the presentation of a treatise on the handling and care of oil used in transformers and switches, with necessary information to keep it in first-class operating condition.

During the past year the committee has been engaged in a campaign to increase the use of uniform service rules for motors presented to the association in 1915. It was pointed out that these rules will not produce the maximum benefits until a large majority of companies have adopted the rules. Believing that failure to adopt the rules has been due to a lack of information about them and to misunderstandings in some cases, the campaign has been carried on with a view to clearing up

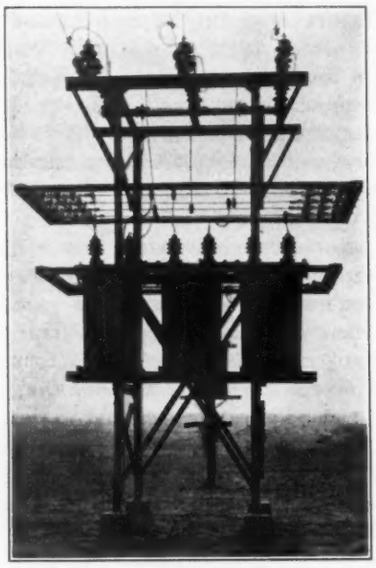


5000-KW. PHASE CONVERTER

all doubt regarding the intent of the benefit to be derived from the use of the rules. Reports from companies which have adopted the rules are uniformly satisfactory. One company in the East reports that:

"The adoption of the motor rules by this company has resulted in an entire elimination of complaints from manufacturers, dealers and customers with respect to the types of motor which are permitted to be used on the company's line. We are so well pleased with the outcome of the adoption of these rules that under no circumstances would we consider going back to the conditions which prevailed before the adoption."

Following the practice of previous years the committee has recorded the progress and development in the



STANDARD OUTDOOR STATION ON ATLANTA (GA.) COMPANY'S LINES

manufacturing and application of electrical apparatus, reviewing the increased capacity of generating and converting equipment. Particular attention is called to the unusually large production of turbo-generators rated at 20,000 kva. and over, a record which perhaps in normal times would not have been reached for several years.

A scheme for guarding against grounds or short circuits in large alternating-current generators was suggested, consisting of the use of balanced current transformers in all six legs of the windings. Frequency changers are increasing in size according to system requirements and speeds have also increased, as has been the case with other apparatus in both alternating-current and direct-current fields. A lubricating system for the bearings of hydroelectric generators is described wherein the entire apparatus is self-contained, the process continuous, the amount of storage relatively small and the system very much simplified. The only progress reported on synchronous motors is the trend toward larger sizes and somewhat higher speed. A comprehensive article has been included on the effect of different types of field construction on commutation and operation of direct-current motors, generators, etc.

According to reports received from several manufacturers, the induction-type regulators can now be built for any rating, voltage or current for which it is practicable to build generators. The replacement of steam engines in high-lift hoisting apparatus has been made possible by the development of an electric motor with light flywheel effect in its armature, thus securing the desired rapidity of starting, stopping and reversing. Attention is called to the fact that one operating company has standardized its outdoor stations with a view to minimizing the expense of construction and maintenance as well as promoting the speed of installation. This company keeps in stock all the material for the

complete erection of the standard size of outdoor transformer substations, and can erect the entire equipment in less than three days. The customer is required to provide the space and concrete foundation for the substation structure. The need of placing safety devices on revolving machinery before it leaves the manufacturer was also pointed out. While static condensers for correcting power factors are not yet ready for general commercial use, it is probable that they will be on a manufacturing basis within the next year. In selecting switches and circuit breakers of all kinds the committee recommends specifying larger ampere-carrying capacities than are actually required, as this class of apparatus is inherently incapable of maintaining its ratings throughout its life without very careful maintenance and frequent adjustment—usually difficult and impossible. Among other apparatus described is a device for controlling welding machines to prevent several machines taking current at the same moment, and an outfit including a kenotron for making high-potential tests on cable systems with high-voltage direct current.

TRANSMISSION AND DISTRIBUTION

Overhead Lines and Inductive Interference

The report of the committee on overhead lines and inductive interference, of which H. B. Gear is chairman, outlines the status of inductive interference as regards ground-return rural telephone lines, metallic circuits and series lighting circuits. It emphasizes the importance of power-company engineers co-operating with telephone engineers in the solution of these problems and informing themselves as to the principles on which means for mitigation of induction are based, so that they may be thoroughly familiar with the conditions which are likely to lead to inductive troubles. The report also outlines the progress made in various states during the year on rules affecting overhead-line construction and indicates their relation to the National Safety Code. The report also embodies an appendix, written by J. B. Taylor, outlining some of the fundamental principles of inductive interference.

The attention of this committee has been given to three principal classes of subjects during the year, namely, inductive interference of power lines with communication circuits, codes of rules affecting overhead construction under consideration or adopted by various states and federal authorities, and matters affecting construction of overhead lines.

The trouble arising from interference with ground-return rural lines is most acute in the states immediately west of the Mississippi River, where independent telephone companies have developed the rural farm line to such a point that it is practically impossible to construct transmission lines from town to town without paralleling such grounded lines for a considerable portion of the distance. Such interference can be avoided only by use of private rights-of-way or by arrangement with railroads for the use of their rights-of-way. Many of these transmission lines are being built to reach districts which are being newly developed, and the use of a private right-of-way is entirely impracticable. Thus the use of highways is usually necessary, and interference cases are the result.

The usual means of mitigating interference not being applicable where grounded-return telephone lines are used and the type of construction employed in connection with many of these telephone lines being of a low grade, but one course remains open for the treatment of the telephone line, namely, to make it metallic. The practice of jumping from one side of the highway to the other in building telephone lines also necessitates relocating considerable parts of such lines in many cases.

While no uniform solution has been found for these problems, power companies have, in general, taken the position that grounded telephone circuits are not a standard or approved method of construction, and that the telephone company could not insist upon any changes by the power company until it had put its own lines in standard condition. However, power companies have in some cases where lines are owned by farmers borne a portion of the expense of making the circuit metallic, as a matter of public policy.

If grounded telephone lines are on poles of uniform height and uniform separation from the power line, transpositions in the latter would be more effective than when the telephone line is of variable height and a variable distance from the power wires. Frequently grounded lines will work better, in spite of the humming produced by the power line, if broken insulators are replaced, high-resistance joints eliminated, tree grounds, etc., removed, grounds at telephone stations improved, and batteries and instruments overhauled.

Telephone engineers in some states have been making maps of all the transmission lines to which their toll circuits are exposed and have asked power companies to provide them with diagrams of generator and transformer connections used in the supply of these lines. It has been explained that this information is needed for the proper working out of transposition schemes for the mitigation of interference and for the guidance of the telephone company in planning new lines.

The problems arising from series lighting circuits are usually due to the use of open loops and are solved by bringing the two sides of the circuit together and by distributing the lamps on both sides of the loop as evenly as possible.

The committee is endeavoring to establish connection with a representative in each state in order to be kept fully informed of progress in matters relating to overhead lines and inductive interference. It is encouraging all member companies to co-operate in the gathering of data relative to the effect of the application of the lines section of the Code to actual construction, so that when occasion arises suitable revisions may be suggested.

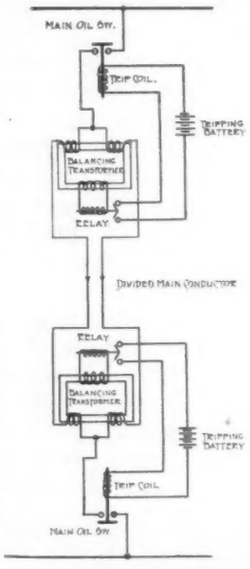
The committee has not undertaken to give attention to the details of overhead-line construction to any considerable extent. The committee has through one of its members kept in touch with the investigations conducted in California with regard to the aging of porcelain insulators. This work, which has a very important bearing on the service rendered by transmission lines, has made progress, but a solution of the difficulty has thus far not been found.

Certain test data on the strength of standard 1½-in. (3.8-cm.) locust pins have been accumulated, and the committee is keeping in touch with the experience of the companies which are using hard-drawn wire.

More attention is now being given to the wave shapes on circuits where there are telephone exposures, because irregular wave shapes may set up high harmonics. Telephones are many times more sensitive to frequencies in the neighborhood of 800 to 1000 cycles than to any of the commercial frequencies. On account of trouble experienced with some combinations of transformer and generator connections with grounded neutral which permit currents of harmonic frequencies to circulate through the earth return, some telephone companies have objected to grounded neutrals in general. Effort should be made to avoid and eliminate such connections at more than one point on a system, but it does not yet appear that there is any adequate ground for sweeping objections to all forms of grounded-neutral connections.

UNDERGROUND CONSTRUCTION AND ELECTROLYSIS

Current-carrying capacity of cables, cable specifications for various classes of service and use of split-conductor cable were the leading subjects presented in the report of the committee on underground construction and electrolysis, of which E. B. Meyer was chairman. Attention was also called to the features of a new design of three-conductor cable in which the belt insulation has been eliminated, the conductor insulation increased, and each insulated conductor enveloped by a metallic covering. Special devices and methods adopted by companies in the solution of operating problems were also included.



SPLIT-CONDUCTOR METHOD OF PROTECTION

In discussing the rating of cables special stress was laid on the relation of load factor to temperature, experience having shown that approximately 40,000 kw. per day is the maximum energy which can be safely transmitted over a No. 4/0 three-conductor 13,200-volt cable. This figure corresponds to a load factor of 73 per cent with a maximum current of 100 amp. and 37 per cent for a current of 200 amp. A number of companies experienced trouble during the summer of 1916 which was probably due to dielectric losses occasioned by the high temperature. The trouble appears to have been confined to sections of duct lines where local conditions impeded the dissipation of heat and to cables operating at pressures about 10,000 volts. It was pointed out that overheating of duct lines may be remedied by allowing water to percolate through the earth around the duct structure.

From tests made recently by the Consolidated Gas, Electric Light & Power Company of Baltimore the following observations have been made: (1) At low temperatures the type of insulating compounds has practically no effect on the dielectric losses. (2) At high temperatures the type of compounds has a very marked effect on the losses caused by variation of temperature in voltage. (3) The ideal impregnating compound should have a practically constant dielectric strength up to the maximum temperature at which the cable operates. (4) The magnitude of the loss may be decreased by changing the distribution of insulation around the conductors.

Various extracts were included from a paper presented by R. C. Powell before the American Institute of Electrical Engineers on the rating of insulated cable.

By revising a compilation of cable specifications prepared by various technical societies and adding new material collected from other sources, the committee has prepared a set of general specifications which should be applicable to all types of wires and cables. The specifications include properties of copper wire, stranding, tinning, and specifications for different types of insulation in common use, including weatherproof braids, high-voltage rubber compounds, low-voltage rubber compounds, varnished-cloth insulation, oil-impregnated paper insulation and national Code compounds.

The increasing importance of maintaining uninterrupted service has required the adoption of the ring or network system, and it has therefore been found necessary to perfect, for operation on a network, a relay system which will automatically disconnect the faulty feeder in a minimum amount of time without disturbing or tripping any other feeders in the network. While the pilot-wire system was satisfactory in theory, under actual operating conditions its disadvantages were serious enough to result in its abandonment in favor of the split-conductor system, one method being shown in the accompanying illustration.

The split-conductor method of protection appears to give practically perfect selective action, and in spite of the slightly higher cost of cable and cable joints it has been adopted by a number of central station companies in the United States. The cost of the cable required is 10 to 15 per cent higher than the cost of ordinary cable, and the cost of jointing is about 25 per cent higher, but additional expense appears warranted because of the better selective action obtained. To correct for any inequalities which may exist in the conductivity of the split conductors, it is usual to transpose the inner and outer conductors at intervals throughout the length of the line.

Joining Three (Split) Conductor 13,200-*Volt Cables.*—The following method is employed by the Public Service Electric Company of New Jersey for making joints in three (split) conductor cables: Before any work whatever is done on the joint the cables are trained so that they will occupy as closely as possible their permanent positions in the manholes. During installation and after the work has been completed no bends having a radius greater than 20 in. (50.8 cm.) are allowed to exist in the cable. After the cables have been trained to the proper positions, they are sawed off so that the ends to be joined will overlap 2 in. (5.1 cm.). The lead sheath is then removed 11 in. (27.9 cm.) from the end of each cable, the outer paper insulation stripped off to within 0.5-in. (1.3 cm.) of the lead, and 4½ in. (11.3 cm.) of the paper around each outer conductor removed. The outer conductors are then bent back out of the way and 1 in. (2.54 cm.) cut off the end of each inner conductor so they will butt squarely. One and three-eighths inches (3.5 cm.) of paper insulation is then cut off each inner conductor. Before proceeding farther the lead sleeve covering the cable joint is slipped over one end of the cable and the ends of the cable sheath slightly belled so there will be no acute edges that will augment

static discharges from the conductors. To aid in properly centering the sleeve before soldering, the lead sheaths are marked 9 in. (22.9 cm.) from each cable end. After the conductors have been cleaned with gasoline, thoroughly tinned and all burrs removed with a file, copper sleeves are slipped over the ends of the copper conductors and soldered thereto by pouring on melted solder. Split-copper sleeves 2¾ in. long and tapered to thin edges at each end are used for joining the conductors. The sleeve and copper conductors are wiped off while the solder is still hot to remove any drops or projections. To remove any insulation which may have been injured in soldering the paper insulation on each conductor is cut ⅜ in. (9.5 mm.) from the ends of the copper sleeve and that remaining is tapered 1 in. (2.54 cm.) further back. After this has been done the tapered ends are dried out by pouring over them melted paraffin heated to a temperature 125 deg. C. In the space which exists between the end of the paper insulation and copper sleeve is wrapped cotton tape to bring the diameter up to that of the sleeve. Tape is then wrapped back and forth between the two ends of the original paper insulation, first applying two layers of cotton tape, then six layers of 1-in. (2.54-cm.) black cambric laid with one-half lap. Upon each layer of varnished tape is applied a covering of petrolatum. Over these coverings of tape are placed two layers of asbestos tape which has been boiled in paraffin.

Over each inner conductor, now insulated, is wrapped a sheet of 3-in. by 4-in. (5.1-cm. by 10.2-cm.) No. 20 B. & S. gage copper which has previously been tinned. After the copper sheets have been soldered on their lapping edges the outer conductors are bent so they will lie flat on the copper sheet, where they are bound in place by No. 18 B. & S. gage copper wire. The copper-wire wrapping is sweated together, special care being taken to remove excess solder and projections. Two layers of cotton tape are wrapped over each outer conductor, overlapping these, turned slightly, and then covered with seventeen 5-ft. (1.5-m.) rolls of black cambric insulating tape.

In applying the tape each turn should be drawn tightly to exclude air and should overlap the preceding turn by two-thirds of its width. After all three conductors are joined and insulated as described, a roll of tape 0.5 in. (1.27 cm.) in diameter should be inserted between them at the center of the joint to serve as a spreader. A band of tape is then wrapped around all three conductors using one and one-third full-size rolls of 1-in. (2.54-cm.) cambric tape, bringing the diameter to such a size that the lead sleeve can be easily slipped over the joint.

After the lead sleeve has been centered, it is attached to the cable sheaths and filled with compound in much the same manner as is usually employed in making joints. The compound is poured at a temperature of 150 deg. C. After allowing it to cool for one hour or one hour and a half, depending on atmospheric temperature, hot compound is again poured into the sleeve to fill any cavities which may have formed during the interval allowed for cooling.

The material needed in making one joint consists of the following: Three copper connectors, three 3-in. by 4-in. (7.62-cm. by 10.2-cm.) No. 20 B. & S. gage copper, 15 ft. (4.6 m.) of No. B. & S. gage copper sheet, 5 yd. (4.6 m.) of cotton tape (one and one-half rolls), two and one-half rolls of varnished-cambric tape, 24 in. (61 cm.) of 5-in. (12.7-cm.) lead sleeving, 1 1/3 gal. (4.91 l.) of compound, 2 in. by 18 in. (5.1 cm. by 0.5 m.) paper pasters, and 3 ft. (0.9 m.) of asbestos tape.

METERS AND MISCELLANEOUS

METERS AND MEASUREMENTS

Standardization of design and methods of maintaining the accuracy of instrument transformers, watt-hour meters and demand meters were the chief subjects discussed in the report of the committee on meters, of which C. H. Ingalls is chairman. The greater part of the report was devoted to additions to the code for electricity meters, methods followed by operating companies in caring for watt-hour-meter bearings and the summary of recent developments in such instruments as watt-hour meters, demand meters, ampere-hour meters, portable instruments and portable test meters. The addition to the code for electricity meters refers to demand meters, the first three parts, devoted to definitions, classifications of meters and specifications for acceptance, being included in this report. Attention was also called to the addition of 160 pages of data to the "Electrical Meterman's Handbook." Among other subjects taken up were instrument-transformer cable terminals, methods of installing instrument transformers, methods of applying corrections to instruments used in connection with instrument transformers, metering house loads, and accuracy of meters on arc furnace loads.

According to letters from eighteen companies, representative of those having the best meter practice in this country, the following conclusions were drawn:

Inspection of Jewels and Pivots.—Practically all companies inspect the jewels at the time of use, but this plan is unsatisfactory because the bill has usually been paid by that time and the company is in a weak position to open a complaint. The needle and visual inspection methods are quick and effective for sapphires. About 33 per cent of the companies use the needle on sapphires and about 25 per cent use the microscope for diamond jewels. The microscope is slow to use, and rather trying on the eyes, but some experts insist that when inspecting diamonds it is necessary and a saving of time in the end. Most of the companies do not inspect new pivots.

The type of meter, its rating and the revenue derived therefrom are the determining considerations in selecting test intervals. Jewel wear alone does not determine the performance of a meter because there are so many other factors. The majority of the companies do not replace sapphire jewels on periodic tests and return the old ones to the laboratory, probably because it is felt that too much useless work is done for the slight benefit gained. Ball-bearing meter jewels are seldom found defective. It seems bad practice to replace a pivot only when the jewel is defective because, even with a smooth jewel, pivots frequently wear blunt and short when running on diamond jewels. The majority of companies inspect registers having jewel bearings at each test.

Care and Maintenance.—Talcum powder is seldom used to carry pivots in because it spills and is mussy.

The meter code recommendations seem weak in this respect, the committee points out, because pivots are always received from the manufacturer with a film of oil on them and they are covered with oil while in the meter. All companies oil the jewels, but some use a film only. It cannot be assumed that oil will remain in the jewel cup until it evaporates, therefore it would seem advisable to place as much oil as possible in the cup. The practice of repolishing sapphire jewels is spreading, but some trouble may be experienced therefrom with shallow jewels, since they are likely to crack. Experience with diamond jewels indicates that it is usually unnecessary to repolish them. The practice of repolishing pivots is coming into favor, but there is a strong difference of opinion manifested in regard to it. More data regarding this practice should be secured, because companies are apparently acting on opinion and hearsay rather than on the economy thereof. Balls are not repolished.

SPECIFICATION FOR ACCEPTABILITY OF DEMAND METERS

CURVE-DRAWING DEMAND METERS

Test	*Test Condition*	*Permissible Error*
Registration	Normal voltage 25% rated current for 1 hour	2% on 25, 50 and 100% of full-scale reading
Equality of elements, two-wire and polyphase	Half full-scale indication	2% difference in current
Variation of voltage.	±10% rated voltage	1½% of full-scale indication
Variation of power factor, single-phase and polyphase meters		2% full-scale deflection
Variation in frequency, single-phase and polyphase meters	±5% rated frequency	1½% full-scale indication
Variation in temperature		Not to exceed 0.25% per deg. C.
Damping		3% in 15 seconds
Sensitivity		Respond to 2% of current of full-scale deflection
Timing	Two 24-hour runs	±0.25% of 24 hours
Legibility of record,	Scale over 2½ in. wide	1% of full-scale indication

INTEGRATED DEMAND METERS

Steps per demand interval		2%
Legibility of record, indicating and graphic recording.	Quarter and full scale	1% full-scale value
Equality of energy intervals	100% rated capacity for five revolutions	1% of time of one revolution
Demand intervals...	Three entire cycles	36 seconds
Contact mechanism.	Full load for 500 impulses	No failures should occur
Registering or recording mechanism	Full load for 500 impulses	No failures should occur
Clock	Two 24-hour runs	Two minutes in 24 hours
Timing motors	Cal. voltage and rated freq.	2% gain or loss
	±5% rated voltage	1% of speed
	±3% rated frequency	6% of speed
	10-deg. rise temp.	2% of speed

TIME-LAGGED DEMAND METERS

Indication.		
Speed of indicator proportional to the load	25, 50 and 100% of full-scale indication, normal ratings	3% full-scale indication
Speed of indicator decreases with deflection	60 and 100% of full-scale indication, normal ratings	5% full-scale indication
Equality of elements, three-wire and polyphase meters.	Same as on curve-drawing demand meters	
Variation in voltage.	Same as on curve-drawing demand meters	
Power factor — single-phase and polyphase meters.	Same as on curve-drawing demand meters	
Frequency, single-phase and polyphase meters	Same as on curve-drawing demand meters	
Variation in temperature	Same as on curve-drawing demand meters	

Use of Diamond Jewels.—Several companies feel that the sapphire gives such good service in small-capacity type C meters that diamond jewels are unnecessary. It is practically standard practice to use diamond jewels in all T. R. W. meters and in large-capacity type C meters. There is a marked tendency to use diamond jewels in alternating-current meters when the revenue is large and the moving part comparatively heavy.

Records.—Many companies have kept records in the past on meter bearings, but practically all have concluded that the expense of keeping them is not justified. When data on certain points are desired, it is best to select a limited number of jewels and keep special records of them rather than to establish a general system applying to all meters in use.

The following recommendations have been offered by the committee, to apply when installing instrument transformers. When a watt-hour meter is used with a current transformer the secondary load on the current transformer should be kept as small as possible, connecting in circuit only the watt-hour meter, the maximum-demand instrument or other necessary apparatus used for billing purposes, and the required leads. If it is found necessary to supply other apparatus from the same current transformers, the effect of this additional load should be determined by tests or from transformer curves. Special precaution should be taken when relays or trip coils are used. The resistance of secondary leads should be kept within 0.15 ohm per 25 volt-ampere capacity of the current transformer. It is recommended that similar precaution be taken in loading potential transformers. Wiring between instrument transformers and meters should be installed in such a manner that the external magnetic effect is reduced to a minimum. It is also recommended that an approved suitable arrangement be installed in the secondary leads to the watt-hour meter for the purpose of readily short-circuiting the current transformer, thus facilitating testing or changing the watt-hour meter. Every lead running between instrument transformers and meters should be identified throughout its entire length, by a color scheme or otherwise.

INTERNATIONAL METRIC SYSTEM

Supplementing English or American measures in the publications of the National Electric Light Association by metric equivalents is urged in a paper by A. E. Kennelly, partly on the ground of international courtesy, so as to open the meaning of the transactions to electric workers in other than English-speaking countries, and partly on the ground of conforming to similar usage in this country. Already the ELECTRICAL WORLD and several American engineering societies are expressing units of measure in the metric system, Dr. Kennelly points out.

WORKING ON HIGH-VOLTAGE LINES

In a paper entitled "Methods for Working on High-Voltage Lines," by J. O. Hardin, the author takes up special arrangements and apparatus used by the Georgia Railway & Power Company when changing insulators or remodeling and rebuilding overhead circuits on lines operated at pressures up to 110,000 volts without interrupting service. Detailed information on this subject was presented by Mr. Hardin in the June 10, 1916, issue of the ELECTRICAL WORLD.

COMMERCIAL SESSIONS

MORE than ever before do the reports and papers of the Commercial Section emphasize the applications of electricity rather than the merchandising of energy and appliances. The reports of various committees on lighting show much care in compilation. As a catalog (1) of successful installations with the necessary illumination information and (2) of lighting equipment, the reports will undoubtedly form a very valuable part of every central station commercial library. In presenting the electric range situation from the standpoint of the central station and of the manufacturer a real advance was made. Each side freely and fully discusses the faults of the other in promoting electric cooking, and such frank discussion should be of material benefit to both sides in addition to proving of inestimable value to the future of cooking by electricity. The report of the committee on commercial service and relations with customers will be of tangible value to many central stations. There are given in great detail the results of a questionnaire regarding applications, credits, meter reading, collections and complaint. The committee has carefully weighed all of the returns, and where in its judgment the consensus of opinion in the answers did not agree with good practice it made recommendations to the contrary.

LAMPS AND LIGHTING

Commercial Aspects of Lamp Equipment

A very complete and comprehensive report on lamp equipment and merchandising is that of the sub-committee of the lighting sales bureau on commercial aspects of lamp equipment (O. R. Hogue, chairman). Suggestions are made for the proper equipment for direct, semi-direct and indirect lighting, and the report may be considered as a composite catalog, showing equipment for all purposes together with the special features of each. It is the first time that a report of this character has been presented.

The report, under the heading "General Discussion," points out the necessity of choosing proper equipment, giving reasons why equipment for use in one case would not necessarily fit all cases. This section is preliminary to the most important part of the paper, namely, the section on lamp equipment, in which the various types of equipment which have developed within the last few years are described together with the application and sales points of each. This section is profusely illustrated. The subject is taken up from the standpoint of both indoor service and outdoor illumination.

In summing up the commercial aspect of street-lighting equipment the committee pointed out that too great stress could not be laid on the importance from the central station standpoint of the appearance of lighting units for all classes of street lighting.

The selling methods are described under the separate heads "Advertising Salesmen," "Illuminating Engineering Service," "Rental," "Equipment" and "Deferred Payments."

Outdoor Lighting

The committee on outdoor lighting (Clarence L. Law, chairman) presents a report which incorporates a collection of material, including photographs, diagrams, equipment data and a discussion of what outdoor lighting comprises. The collection of photographs is a representative one, giving an illustration of each class of lighting and a diagram where available. Mention is made of the equipment. Part II is a presentation of all available equipment to date with illustrations of lighting units, photometric curves and other data which can be utilized in the designing and construction of a system of outdoor lighting of any description. The committee emphasizes floodlighting, which represents the greater portion of outdoor lighting exclusive of street and sign lighting. An effort was made by the committee to ascertain what methods have been employed by the central stations to take on floodlighting business and what campaigns have been started in this direction. It was found that practically nothing has been done to indicate that the subject has ever been very seriously considered as a method of increasing the lighting load. Floodlighting of vertical surfaces and horizontal surfaces is considered.

NIGHT VIEW OF DRILL FIELD FLOODLIGHTED

As a new field for the promotion of the lighting industry outdoor lighting promises to be a channel leading to greater volume and increased load. By the intelligent application of the available material this new field should be a stimulant to both lighting salesmen and prospective customers.

Industrial Lighting

The committee on industrial lighting of last year in its report outlined the field that was open for industrial lighting and its needs. It is the desire of this year's committee (J. J. Kirk, chairman) to emphasize the means of getting this business and to give such data and information as will be valuable in so doing.

Under the heading "New Ideas" is described in detail new apparatus for industrial lighting.

In last year's report a table will be found giving recommended intensities of illumination for different

classes of industrial plants. The committee calls attention to the present trend toward higher intensities and suggests that in most cases the maximum intensity, as recommended in the table, be used as the minimum value, and that the new higher intensities be increased in the same relative proportion.

Some of the methods used in selling industrial illumination are fully described.

In purchasing reflectors for any installation great care must be taken to select the fixture which is designed for the size of lamp desired. The committee feels that this is of prime importance. The style of reflector is largely determined by the spread of light required, the hanging height and the kind of work. The kind of factory must also be carefully considered.

As shown by the various photographs in the report, the common practice now is the use of general lighting. With a few exceptions, the illumination of nearly all factories can be taken care of by this method. To obtain good results from this method, however, it is necessary to use the larger lamps equipped with proper reflectors. Although each factory has its own requirements and no fixed rule can be followed in designing illumination, the average condition is taken care of by direct lighting with 200-watt gas-filled lamps spaced 15 ft. (4.5 m.) apart and having a hanging height of 9 ft. (2.7 m.). These photographs are accompanied in each case with full details of lamp spacing and requirements.

In conclusion the committee urges those connected with industrial lighting to keep on file for constant reference the data and general information on this subject which are being published by the technical press, the electrical societies and, more especially, by the Illuminating Engineering Society.

COMMERCIAL ASPECTS OF STREET AND HIGHWAY LIGHTING

The purpose of the report of the sub-committee of the lighting sales bureau on commercial aspects of street and highway lighting (Alvah W. Young, chairman) was to present some facts and figures as well as opinions, indicating that the method of handling the street-lighting situation should be changed. The committee found that the increase in revenue in street lighting is not always kept up by the increases in other classes of business. During a period in which the population of a city has doubled its assets property valuations may have increased more than ten times and yet the expenses for street lighting have increased but a few per cent. The attention which small central stations have given to street-lighting business, the committee states, is decidedly not in proportion to the importance of this line of activities.

The favorable publicity which may be obtained from careful attention to this field is well worth the consideration of every central station, and it is recommended that central stations exhibit all types of lamp and standards which they are permitted to install and issue a booklet explaining the purpose of these different types of illumination in terms that the layman can understand.

In order to overcome the tendency to install units in haphazard fashion regardless of spacing and equal distribution of light, the entire street-lighting situation of a town, the committee feels, should be carefully analyzed and a perfect installation mapped out covering spacing and height and size of lamps; this plan, once adopted, should be strictly adhered to, even though growth will be gradual and the complete installation will not be secured for some time.

The committee urges that a lay-out of each lighting district be made and placed in view in a number of prominent places in business and residence sections, with a note of explanation as to what it is and why it was made. In many cities which are inadequately lighted it may be difficult to obtain authorization for a change without demonstrating in some way what a revision of the system will bring about, although a change may require but a moderate increase in cost. It is believed that in such cases it will no doubt be to the interest of the central station to install and maintain a thoroughly modern lighting system for perhaps one mile on a given street.

In order to supplement the larger lamps used at street intersections so as to provide illumination in the middle of long blocks or in outlying territories small incandescent lamps have frequently been recommended. Such installations, it is pointed out, represent a relatively high investment per candle-power, and it is usually found that the rate for a 32-cp. lamp should be but little less than that for a lamp three times as large. The committee therefore recommends that the 100-cp. size be considered the minimum for use in street-lighting installations.

The system of education which is recommended, it is felt, should be used not only for governing bodies of towns but also for the general public so that they may know what they are getting and what constitutes good lighting. Recommendations are made that the central station companies make an effort to co-operate to a greater extent with consulting engineers.

It has been a difficult problem to secure the proper illumination of interurban, county, state and national highways, and the committee recommends that this problem be taken up in the manner suggested for other street lighting. The public should be educated along this line and suggestive and carefully prepared advertising matter be sent to the various road associations, township bodies, county governing bodies and the state government, to bring to their attention the possibility of increasing the state revenue by encouraging interurban traffic and thereby raising land values.

The cost and selling rate of street lighting, it is felt, should receive more attention, and as a step toward standardization of costs by central stations the committee requests that consideration be given to the points enumerated in an endeavor to make the rates for street lighting uniform throughout the country.

The committee therefore recommends consideration of the following items of investment expenses, which should be used in formulating a street-lighting rate:

Consumption per lamp in watts; watts per lamp at station; consumption per lamp per annum; station output per lamp per annum.

Investment.—Real estate, including real estate for generating and substations, storeroom buildings, stables and offices; buildings and foundations, including generating and substation equipment; boilers, condensers, piping, etc.; engines and generators; switchboard, wiring, transformers, including substations; miscellaneous pumps, heaters, etc.; distribution and transmission lines; lamp and tub transformers; miscellaneous equip-

ment, horses, wagons, automobiles, tools, etc.; working capital and supplies.

Operating Expenses and Taxes.—Production and transmission; maintenance of lamps; line maintenance; general expense and taxes; franchise tax; lamp replacements; reserve for replacements other than lamps; return on investment. The total would equal the rate per lamp per annum.

ELECTRICAL ADVERTISING

In presenting this report on electrical advertising, the committee, of which C. S. Buller is chairman, decided to approach this subject from an angle somewhat unusual. Previous reports on electrical advertising read before the association dealt with the subject after the medium had been sold, neglecting the difficulties which are encountered both by the central station and the sign manufacturer. This committee, therefore, treats the subject from the standpoint of the central station and electric sign manufacturer, before the sale takes place.

The committee recommends that the term "electric sign" be stricken from the vocabulary of the central station and the words "electrical advertising" be substituted therefor.

From information secured by the committee it would seem that the field of electrical advertising has not been so energetically exploited by the central station as have other classes of business. The reasons given by the committee are, first, the apathetic attitude of central stations toward this subject, due to the fact that they have not sold themselves the idea of the electric sign or illuminated billboard as a means of electrical advertising.

In discussing the commercial advantages of electrical advertising, the committee points out that the load is practically over and above expenses. The service and meter are already in place and rarely have to be changed. No extra bookkeeping is required. The average use of the appliance load, so eagerly sought, is estimated at only 7 per cent of the sign hours.

The principal argument used against the usual electrical advertising campaign is that it is only a spurt and is generally followed by a period of inaction. Granting the truth of this, the committee states that for a moment it is possible to overcome any such tendency by consistent and steady plugging. It is most probable that herein lies the cardinal fault with electrical advertising, that although the electric sign campaign in itself may be successful the business as a whole may prove a failure because there was no intelligent follow-up system.

What has also been mentioned as a drawback to the sale of electrical advertising is restrictive or unreasonable sign ordinances. As an aid to those who have encountered this difficulty a model sign ordinance is appended to the report which embodies the best features of the ordinances of a number of cities. The committee recommends, however, that in the promulgation of new ordinances the work be done under the auspices of the local merchants' association or some similar organization.

Another practice that has hindered the successful sale of electrical advertising, and more than anything else has brought about the passage of restrictive ordinances, is that of putting up electric signs which, in point of design, are monstrosities. The fault, the committee states, lies entirely with the sign manufacturers and the central station, and it feels that the central station should in all cases act as the censor of every form of electrical advertising.

Regarding the advantages of a sign campaign, the committee states that the business is secured at a minimum cost per dollar of income. Successful requisites of a successful campaign were discussed. In the opinion of the committee, the representative of the central station engaged in selling signs should be a specialist in the sale of advertising. The committee recommends that central stations maintain a patrol system as the best means of keeping signs in service after erection.

The committee not only recommends but makes a plea for the establishment of a flat rate for electrical advertising. In all classes of advertising other than electrical a flat rate is charged.

The committee recommends that where signs are hung on side walls or against buildings the flashing effect be used on borders only, while the main portion of the sign remains fixed. It is recommended further that wherever possible every sign, no matter how small, have something in motion, as there is nothing else that will so quickly attract the eye.

The report concludes with a detailed discussion of some factors influencing sign design and illumination of billboards, such as spacing of letters, spacing of lamps, finish, color and candle-power of lamps.

ELECTRIC RANGE

ELECTRIC RANGE STANDARDIZATION

The report of the sub-committee on electric range standardization (C. E. Greenwood, chairman) shows evidence of a real desire to accomplish some tangible results, the most evident being that of urging economy in manufacture. This committee has studied its subject with two objects—standardization of the general features and standardization of the independent features of electric ranges.

The cost of range manufacture has increased to such a degree that this feature, it is pointed out, is one of the greatest impediments to the introduction of electrical equipment. Everything that can be done by the manufacturer to reduce this production cost will be beneficial.

The public need, it is felt, can be met with fewer models, and the committee therefore recommends that until such a time as the range field has reached greater development manufacturers sacrifice the commercial feature of individuality in numerous designs and decoration for the important features of better workmanship and lower production cost. Fundamental types would be (1) the so-called cabinet range with canopy, a minimum of three surface burners, side oven, right or left, and a warming closet, and (2) the flat-top range having a minimum of two burners and with oven below the cooking surface.

The committee believes that compactness in the range is a desirable feature and recommends that the manufacturers standardize on over-all dimensions for the fundamental types. A standard height of 33 in.

for cooking surfaces is suggested. The committee feels that further progress could be made if the manufacturers would get together on minimum standards in quality, in thickness of insulation and in gages and kinds of sheet steel. With full appreciation of the efficiency problem in heating, that only essential space be used for the performance of everyday cooking, the committee recommends ovens in three sizes, the smallest to be 18 by 12 by 12 in. (45.72 by 30.48 by 30.48 cm.), which is the standard used for small gas ranges, and the largest 18 by 18 by 14 in. (45.72 by 45.72 by 40.54 cm.). For broiler burners approximate dimensions 12 in. by 12 in. (30.48 cm. by 30.48 cm.) are desirable, with an approximate wattage of 1800. The size, wattage renewal, cost and maintenance are the vital features of surface burners in the development of the range business and are discussed to some extent by the committee in its report.

The committee is of the opinion that the built-in terminal box adds materially to the cost of the range and is not essential. The simpler method of merely three wires from the range to which the wireman can connect, and standardization on the point from which these wires lead from the range, is suggested. It is the consensus of opinion that separate fusing of burners is desirable, and the committee recommends strongly the placing of the fuse block in an accessible location. Pilot lights are another accessory that it is generally conceded should be omitted in the interest of the production cost of the range. The committee hopes to see every manufacturer adopt a range receptacle for small devices such as coffee percolators and toasters, which are practical accessories and in some instances more efficient for the purpose than surface burners would be.

The committee recommends that range switch design and operation be standardized. Standard labels on switch signals, it is recommended, should be "high," "medium," "low," "off," instead of "1," "2," "3," "off." The "off" position is an important point, and this signal should be distinctly different from the others.

Installing a low-wattage burner in the warming closet has been under consideration, but the committee doubts the wisdom of this additional expense, recommending that the warming closet always be placed next to the oven. Manufacturers are urged to adopt standard crates for ranges of various types, to have crates interchangeable if possible, and to exercise every possible care at the factory to insure safe delivery of their products at the point designated.

Appreciating the value of standardizing the names of range parts, the committee presents suggestions to this end in an appended list to its report, entitled "Electric Range Nomenclature."

Co-operation Between Manufacturers and Central Stations

The sub-committee of the electric range committee on co-operation between manufacturers and central stations, under the chairmanship of H. E. Young, points out that some national and local range advertising has been conducted which has in no small way contributed to the rapid introduction of the "cook-by-electricity" idea. The committee is of the opinion that this idea could be quickly, economically and convincingly conveyed to the public by national co-operative advertising conducted by the manufacturers of the ranges. While some publicity articles on the subject of cooking by electricity have appeared in the national and local publications, the committee feels that full advantage has not been taken of all the opportunities available, and that it could arrange for the preparation of educational articles which through the Commercial Section could probably be released to a large number of magazines and newspapers. Motion pictures and lectures are suggested, as are also demonstrations. The committee recommends that all manufacturers compare and send out with every range a booklet giving instructions as to the use of the particular range.

The committee feels that in view of the excellent organization effected through the electric range committee, the Commercial Section and the N. E. L. A. a separate society of electric range manufacturers should be unnecessary, and it recommends that the advantages of association membership be brought to the attention of any range manufacturer not at present a member. The report concludes with a general discussion on prices and merchandising.

Electric Range Manufacturers' Viewpoint

The work of the sub-committee on the electric range situation from the viewpoint of the manufacturer (J. Paul Clayton, chairman) was commenced by the chairman of the general committee, who sent to each member a letter in which was very clearly explained the necessity of the manufacturers pointing out frankly those conditions which in their experience are impediments to the more general introduction of the electric range. From replies received this report has been compiled.

No. 1. General Education.—A woeful lack of knowledge prevails in a great many places in regard to electric cooking and electric ranges.

No. 2. Prices.—There is some opposition, generally speaking, on the part of central stations to the slight preferential in discounts offered to jobbers under the Hoskins patent license, and it is suggested that until the time (probably one year) is ripe to secure modifications central stations forget if possible their objection to the schedule.

No. 3. Quality of Ranges.—One of the troubles with some central station men is that they oftentimes take a narrow view of a manufacturer's product and purchase entirely on low price rather than price and quality combined.

No. 4. Sales Service.—There is probably no one thing which has caused more annoyance to manufacturers during the past year than unreasonable demands for sales service on the part of central stations. It is not suggested that manufacturers ought not to do something in a broad way to help the sales locally, but that the manufacturers' representative should teach the local company's salesmen how to sell ranges.

No. 5. Sales Methods.—Size, arrangement of organization and difference in point of view vary the difficulties encountered in working with central station customers. For clearness in presenting this subject it is divided into five parts, covering successive steps in a range sale:

(a) Finding and Handling the "Prospect."—The central station by analyzing its lighting company customers and segregating the live range prospects can cut selling expense by confining range advertising to the real prospects.

(b) Selling the Idea of Electric Cooking.—A demonstration of the range to the prospect is necessary before a sale can be made.

(c) Selling the Range.—Range prices and wiring costs should be given to prospects as one quotation.

(d) Follow-Up Work.—Every purchaser of a range must be taught to operate efficiently.

(e) General.—The range problem should be considered from the consumer's point of view and not the engineer's.

Combined with these facts there are entirely too many models of ranges.

No. 7. Renewals and Repairs.—Another item which pertains entirely to the dealer or central station is that where a manufacturer has to absorb generally the expense of returned used material, this expense must be covered in the retail or trade prices of his product.

No. 8. Central Station Policies.—There is a lack of broad policy in central stations, of enlightened self-interest in assuming their proper share of the burden with the manufacturer.

No. 6. Operating Conditions.—A great portion of the trouble in the last two years has been, not with the attitude of the central station men themselves, but with the conditions which prevail in their territories. This especially applies to the variation and non-standardization of voltage.

CENTRAL STATION VIEWPOINT

After very careful consideration it was decided that in the opinion of the sub-committee on central station viewpoint (R. B. Snyder, chairman) the most important impediments to the range business are included under the following general subjects: The absence of specific information as to the practicability of the electric range, and inactivity on the part of manufacturers and central stations in promoting range business among employees.

When effecting electric range sales it is found that the first cost is an item which is generally foremost in the minds of prospective customers, and heretofore at least this cost has been a marked obstacle to their more general introduction. This obstacle can be overcome in the majority of cases, where the customer can afford the price, either through adequate sales argument or by giving time-payment terms.

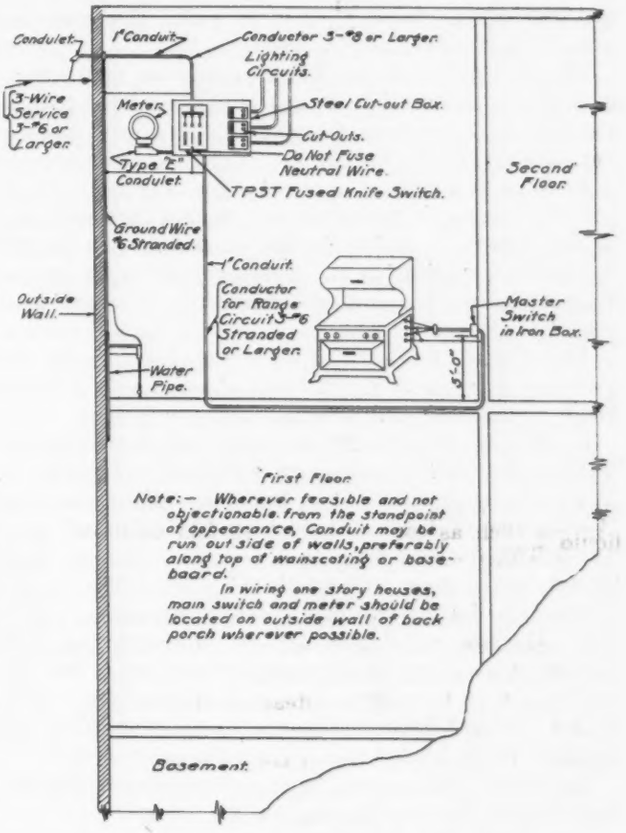
Many of the troubles of the electric range in service arise through the inefficiency and lack of preparedness of the central station companies, due in a great measure to the lack of foresight on the part of the sales department when planning the campaign that placed this electric range in service. Another impediment in the way of popularizing the electric range is lack of enthusiasm and faith on the part of the salesmen. Still another thing that stands in the way of developing a public opinion in favor of the electric range that will result in a demand for it, and for the service it means to central stations, is the lack of what is called the "humanizing" of it.

TECHNICAL INFORMATION AND DATA

The sub-committee on technical information and data (Hartwell Jalonick, chairman) had hoped to incorporate in its report curves and the data on the various makes of ranges, but found such a compilation practically valueless. Considerable technical information, however, is contained in data secured through the courtesy of A. Stockstrom, an electrical engineer.

From the results of certain tests made by Theodore Dwight of the Society for Electrical Development, the committee feels that it cannot too strongly urge that great care be exercised by range salesmen in their endeavor to have the customer use proper utensils if the most satisfactory results with electric cooking are to be secured.

Wiring.—Some of the features which contribute most to the possible success of the electric range when installed are (1) the matter of providing proper installation on the customer's premises, (2) proper service leads from the secondary lines to the customer's meter loop,


Conduit
1" Conduit
Conductor 3-#8 or Larger
Lighting Circuits
3-Wire Service 3-#6 or Larger
Meter
Steel Cut-out Box
Cut-Outs
Do Not Fuse Neutral Wire
Type "E" Conduit
TPST Fused Knife Switch
Second Floor
Ground Wire #6 Stranded
1" Conduit
Outside Wall
Conductor for Range Circuit 3-#6 Stranded or Larger
Master Switch in Iron Box
Water Pipe
5'-0"
First Floor
Note:— Wherever feasible and not objectionable from the standpoint of appearance, Conduit may be run out side of walls, preferably along top of wainscoting or base-board.
In wiring one story houses, main switch and meter should be located on outside wall of back porch wherever possible.
Basement

WIRING FOR RANGE INSTALLATION

and (3) the proper installation of secondaries, transformers and primaries on the company's distribution system.

A set of specifications for wiring of electric cooking and heating devices is included.

Information regarding expense incident to serving an electric range installation shows a total of $75.02, apportioned as follows: Pole line, $37.52; transformer, $16.50; service, $12.50; meter, $8.50.

The committee is prepared to suggest that when the manufacturer is in a position to supply speed in top-burner operation, without abnormally increasing the demand or account of the apparent present-day decrease in inherent efficiency, then it will recommend the installation of at least one fast burner element in each range. It is recommended that the central station go slow on the idea of endeavoring to secure for electric element speed the equal operation of the other fuels. For a similar reason the committee is of the opinion that boiler element wattage should be deferred. It is felt that by preheating the oven will give better and faster results.

INDUSTRIAL HEATING

INDUSTRIAL ELECTRIC HEATING BUREAU

Numerous inquiries for information and figures on various applications of industrial heating have come to the members of the committee on industrial electric heating bureau (H. O. Lobell, chairman) from manufacturers in a great many lines.

It is most desirable in figuring on the application of electric heating to a process to make the operation automatic in so far as possible.

The application of continuous operation in the form of belt, chain or other means is not confined to low-temperature operations, but can be and is used in high-temperature work as well.

In designing apparatus of this type it is necessary to consider the entire operation as a unit so that each part of the apparatus and each step in the process as well as the heat application all work together in the proper cycle and sequence and each part does its work most economically.

The committee wishes to lay great stress on the importance of correct ventilation, which does not mean large piping with heat loss, but correct design.

In space heating there are several considerations to be borne in mind when the application is being laid out. The units must be placed so that there will be an even distribution of heat. There may be a flow of some liquid which would drop on the heaters if they were placed on the floor or beneath the work. This might damage the heater and also create a dangerous condition. Heating units must also be so placed that local heating or heating in a particular section is not excessive, for it is evident that if this condition is permitted it might damage not only the apparatus, but the material being heated and the heating unit as well.

The report gives a very brief outline of new developments in electric heating apparatus.

The committee in considering the advisability of publishing general or specific data resolved that in view of its variety a central point for the filing of this material should be established, thus making it available to all members for reference.

WIRING

The report of the committee on wiring, of which R. S. Hale is chairman, concerns itself largely with standardization and concentric wiring. Up to the present year the committee has considered actively standardization of the attachment plug only at the socket end of the portable cord, and, of course, the corresponding wall receptacle. When the problem was first assigned to the committee the number of non-interchangeable designs was very great. Because of patent difficulties and trade disputes the adoption of a single design of uniform arrangement so that all plugs shall be interchangeable has not been reached. The end is, however, not far off, and the committee hopes before many years to be able to report approximately complete success. The second part of the plug problem is that on the appliance end of the portable cord. Discussion has arisen as to whether round, square or flat prongs shall be used on the appliances, and if flat prongs are used, whether they shall be placed parallel or tandem. A conference of manufacturers indicated a cordial desire to co-operate and resulted in the appointment of two committees, reports from which, however, will not be available until next fall.

The question of polarity of plugs and receptacles is not very pressing, while almost no wiring installations are polarized, but this may become important, the committee feels, at almost any time. The committee believes that all the receptacles should now be designed for polarization as this involves no extra expense and no trouble in using, but that it is not worth while to make the plugs polarized until the need therefor shall arise. The consensus of opinion is that any standardization of the cord, as distinct from the plugs, would be undesirable.

Regarding the standardization of range connections, the committee has come to the conclusion that so long as a real demand exists for either type of construction—built-in-terminal box containing the switch, fuse and possibly a pilot light, or with three wires only—the manufacturer should be allowed and encouraged to supply that demand.

In connection with pilot lights the committee states that it is true that a pilot light on such installation may be very desirable to prevent energy being consumed unintentionally, thus obviating waste of electricity and deterioration of the heating elements from over-use, but this is purely an economic question. While the use of pilot lights might be encouraged for these purposes, it certainly should not be required for safety.

In connection with concentric wire the committee points out that a number of installations have been made in different cities and further reports have been received from abroad. In no case, it is stated, has any fire or accident or trouble of any sort due to the method of wiring been reported. Although now forbidden by the United States National Electrical Code, the use of concentric wire is permitted by the codes in nearly every other country in the world. It is true, of course, that many of these codes impose certain limitations on its use, but this is equally true of every form of wiring or conduit. Reports on the use of concentric wiring by various companies in this country are included. After presenting these reports the committee states: "All the evidence based on all the installations thus far made is to the effect that the method will be safe. There is absolutely no evidence that the method will give trouble, provided that the same precautions are taken for new installations that have been taken for those already installed all over the world, including of course those in the United States. We therefore ask: (1) That concentric wiring be allowed in America subject to the conditions under which it is freely and safely used elsewhere; (2) that further experimental installations be permitted with the object of ascertaining where it can be used to the best advantage and to a still greater extent."

At the request of the National Association of Building Managers, the committee has considered the use of the lead-covered twin wire recommended by it and used

in many of its buildings. An attempt has been made to secure other evidence, but a considerable prejudice has been found. This prejudice, however, seemed not very different from the general prejudice against anything that differs from present methods, and the committee therefore voted that, on the evidence presented, it was in favor of the wire.

The committee continues its recommendation for a solid neutral from the generator (or transformer) to the lamp in all grounded systems, this including the grounded side of two-wire branches from three-wire systems. In order to take advantage of the grounding of the neutral wire and also of the solid neutral, it is desirable, the committee states, that it should be of a color distinct from the outer or potential wire, and the committee last year took a position in favor of a standard color. After discussion with the manufacturers, the latter recommended the use of unbleached cotton with paraffine filler, which would be whitish, but not so white as to give trouble from getting dirty. The Underwriters, the committee believes, are also in favor of this but have apparently not yet felt the time ripe.

The committee has recommended a change in the Code to allow the use of cheaper insulation, for example, weatherproof instead of rubber for the neutral wire when it is of a distinct color. The committee considered the question of the use of the sizes of wire different from those permitted by the Code and voted that the use of No. 16 or larger sizes should be encouraged for fixtures or portables or for any location where devices larger than the ordinary lamp would be used. At the request of the insurance expert the committee has considered the question of whether devices for fusing solidly recently placed on the market would not be dangerous in the hands of customers. On investigation it was found that many manufacturers are selling similar devices and member companies use them or something similar freely. Standard rules regarding connection beween inside wiring and outside lines have been begun.

COMPENSATION AND EDUCATION

Compensation of Salesmen

Investigation of the methods in use by member companies with reference to the compensation of their sales forces, it is pointed out by the committee on compensation of salesmen (C. J. Russell, chairman), shows that the same diversity exists both in practice and opinion as is found in other organizations.

Fundamentally there are but two methods of compensation—the basis of the oldest and most popular method being a salary, and that of the modern and scientific method being a commission. As might be anticipated from the growth or rather the nature of the growth of the electric light business and of its commercial department, the straight salary method is in use to a greater extent than any other plan. Many of the most progressive and aggressive commercial managers believe it to be the best and many have returned to this basis after experimenting with other systems based on actual sales results. The essence of the opinions expressed by those writing in favor of the salary method of compensation is primarily that many elements outside of the question of daily sales enter into the work of the salesman, the value of which cannot be measured in dollars and cents. Some estimate the proportion of time given to actual sales as 40 to 50 per cent, the rest being devoted to holding business, commercial service and advisory work. It is also quite generally felt that a salary method of compensation appeals to the higher grade of salesman as being more dignified and a more permanent arrangement.

Very few companies are operating on a straight commission basis for other than appliance sales. The feeling is quite general that if a commission plan can be established on a proper basis such a method of compensation would be the best for the salesman as well as the company employing him. Modifications of a straight commission basis have been applied by a number of companies, and these are principally along the line of a small salary plus a liberal commission or a liberal salary plus a small commission. In some cases the salary is considered a compensation for that portion of time which is devoted to other work than that of securing new business, and commissions are allowed on all business connected up. In other cases the plan adopted represents a straight commission with a drawing account which must be offset by a given number of sales before commission allowances are added to the salary. The second plan of a liberal salary with a small commission on completed sales is equivalent to a straight salary method of compensation with an incentive to the salesman to increase his earnings to the utmost. A modified system of commission or allowances is found in the various methods of bonus payments.

In connection with power salesmen and specialists the committee reports that in most cases these members of the sales force are paid on a straight salary basis for obvious reasons. In general they handle only the larger or more important propositions, the average salesman being required to inform himself sufficiently to handle small and ordinary lighting and power cases. Certain companies have extended their commission schedules, however, to include such specialists as are actually engaged in sales work.

Education

The committee on education (Fred R. Jenkins, chairman) for this year has continued along the lines outlined in its report of last year. It is now conducting two courses by correspondence, the commercial engineering course and a course in practical electricity.

The commercial engineering course, while particularly adapted for the use of men employed in the commercial departments of the companies, is at the same time quite broad in its scope, and it has been found that a large number of subscriptions are from men employed in other than commercial departments. The course in practical electricity is a fundamental course for employees not having an electrical education and is an elementary course very broad in its scope. It is intended for employees of all departments who desire a foundation from which to specialize in any branch of the business. The former has proved successful, and while the latter was only recently started, from present indications it should prove equally popular with the first course, if not more so.

It is found that where some executive of a member

company takes a personal interest in acquainting the employees with these courses no difficulty is experienced in organizing a class, and that the employees look to the company for indorsement and assistance in educational work, which is mutually beneficial.

The first edition of the commercial engineering course has been practically disposed of, and the committee has considered the publication of a second edition and makes such recommendations in this report. The total subscriptions to March 1 amount to 1358, of which 20 per cent have received the last lesson. Of this number 25 per cent have qualified and received certificates.

There follows in the report a short description of each lesson with the table of contents. These lessons can be sent monthly or semi-monthly as desired. Sufficient stationery is sent to the subscriber for use in answering the tests, which consist of practical problems prepared from actual experience.

The course in practical electricity as recommended in the committee's report of last year has been inaugurated, the first lesson having been sent out on Jan. 1.

Owing to the necessary time required to organize the committee for this purpose, the course was not thoroughly advertised, but notwithstanding the late start and insufficient advertising there was a total enrollment to March 1 of 466 subscribers.

The committee recommends (1) a course in electrical appliances for the use of seminaries and colleges having courses in domestic science; (2) a second edition of the commercial engineering course to be printed and sold, and that the price be advanced from $12 to $15 for a complete course of seventeen lessons; (3) that the price of $12 for the course in practical electricity be continued to all subscribers during the coming year, and (4) that an active campaign for subscribers be started in the member companies as early as August.

MERCHANDISING AND COMMERCIAL SERVICE

Special Service and Relations with Customers

One of the reports that stand out is that of the committee on commercial service and relations with customers (R. F. Bonsall, chairman). The report gives the result of a questionnaire sent out to some seventy-five companies in various sections of the United States, replies being received from thirty-eight, showing present practice affecting applications, credit, meter reading, collections and complaints. All of the questions contained in the questionnaire are given, with the full results of answers, and where suggestions were received these are incorporated in the report.

Salesman's Handbook

The report of the committee on the "Electrical Salesman's Handbook" (R. H. Tillman, chairman) says that inasmuch as last year's committee completely revised the handbook, reindexing and publishing it in admirable form, the present committee has endeavored only to improve and add to the various sections.

As one member rarely uses more than one section, the committee makes the following recommendations: (1) That each member be furnished with a binder and only that section in which he is interested; (2) that for the present the sections be divided into three parts, lighting section, power section and electric vehicle section; (3) that a power salesman be furnished with the section on electric power, including industrial heating, and a lighting salesman be furnished with the section on lighting, including domestic heating; (4) that where a member desires a section in addition to the one furnished him he shall be charged for it; (5) that each member company shall be furnished with one or more complete volumes of the handbook to be placed on file for reference use.

Other suggestions and recommendations are made regarding the formation and work of the handbook committee.

Merchandising Committee

The merchandising committee for 1917 (J. V. Guilfoyle, chairman), having held six meetings and accumulated through correspondence and personal touch considerable information on the subject of the merchandising of electrical appliances in central stations, does not believe that progress in the merchandising of electrical appliances in the last year or two necessitates a revision of the policy or principles set forth in previous reports.

Clocks in the Field of Electric Light Appliances

A means of controlling frequency is described in a paper by Henry E. Warren entitled "Clocks in the Field of Electric Light Appliances," whereby, it is claimed by the author, it is easy to reduce the error in the average value of frequency to less than one-thousandth of 1 per cent as measured day by day.

Profitable Appliance Business

The committee on profitable appliance business (C. E. Greenwood, chairman) has studied its subject from three viewpoints of what constitutes a profitable appliance business, and has classified appliances according to their "profit" to the central station.

Appended to the report is a compilation of suggestions under the captions "Do" and "Don't."

Appliance Sales in Cities Under 30,000

The report of the sub-committee on possible appliance sales for central stations in cities of 30,000 or less (E. R. Davenport, chairman) states that there are a surprising number of small central stations which do not sell electrical appliances.

Business done with vacuum cleaners, washing machines, sewing-machine motors, electric fans, etc., was treated as a separate subject. This type of business has not been developed, and after investigation it was found that a figure equal to 50 per cent of the total appliance business must be added to include this apparatus.

The estimate of total electrical merchandising business per residential connection, for average cities of 30,000 or less, arranged geographically, is as follows: Northern Atlantic States, $0.506; Southern States, 0.675 cent; Middle Western States, $0.900; Southwestern States, $0.484; Pacific and Rocky Mountain States, $1.744. The figures given do not cover portable lamps. This business has not yet been developed with the small central station. The committee recommends that small companies take up the sale of portable lamps.

ELECTRIC VEHICLE SESSIONS

THERE is unusual evidence this year in the reports and papers presented before the Electric Vehicle Section of a desire on the part of those promoting this branch of the industry to get down to fundamentals and frankly and sincerely to look the underlying problems in the eye. Co-operation by all interested is the keynote of the contributions, and in view of the past history of electric transportation development is significant. Should the manufacturing interests and the central stations adopt and carry out the suggestions and recommendations made in these papers and reports, there is no doubt that a step will be taken in the right direction and should do much to put electric transportation of the future on a better footing.

SALES PROMOTION AND CO-OPERATION

Manufacturers and Central Station Co-operation

Appreciating the fact that little is to be accomplished by making a fresh start each year, the committee on co-operation between manufacturers and central stations (George B. Foster, chairman) determined to augment the work of previous committees so that results might be cumulative. The committee received from a member vehicle manufacturer a proposal to offer a maximum discount on its product to Class A members through this committee, and it was accepted on condition that all of the manufacturers should have the same opportunity. Considering the plan in its entirety, it was worth the effort and expense, but the results were disappointing as compared with expectations.

At a meeting of vehicle, battery and accessory manufacturers it was proposed that this committee should procure the services of a representative with all the qualifications to present the many advantages of electric transportation in a most convincing manner to the officials of the larger central stations that are not showing any marked interest in this field. The plan was approved on condition that the necessary funds could be secured for a trial of one year, the cost of which was estimated at $15,000.

This proposition met with the unqualified approval of the chairman of the publicity and advertising committee, and assurances of financial support were received. The sub-committee called upon the majority of the larger manufacturers and laid the plans before them with the request for financial assistance and co-operation. A very small minority of the manufacturers took a definite stand against the proposition. The majority were favorable to the plan but differed materially as to the basis upon which assessments should be made for the balance of the funds.

Correspondence has been had with manufacturers relative to establishing a uniform guarantee for electric vehicles exclusive of batteries and accessories. Most manufacturers are willing to co-operate in the matter. The standard of the National Automobile Association of Commerce has been recommended.

Motion-Picture Films

During the last year the committee on motion-picture films (Carl H. Reed, chairman) has endeavored not only to increase the number of films showing the electric, commercial and pleasure vehicle in action, but to enlarge the scope of its activity by securing motion pictures of electric industrial trucks. Co-operation of manufacturers was requested but the results were unsatisfactory.

Customer's Viewpoint on Electric Vehicle

"I want to say first," says F. M. Feiker in his paper, "The Customer's Viewpoint on the Electric Vehicle," "that, now I have found out all I needed to know, now that I have asked and persisted in questions, I am satisfied with the service my car is giving me."

He found it too hard to buy an electric car. As central-station men, as manufacturers of cars and batteries and equipment, the industry is talking too much about itself and too little for the customers.

Questions the Pleasure Car Buyer Wants Answered

(A summary of actual questions obtained by correspondence and from personal investigation.)

1. Is the "electric" a utility car? Is it cool in summer? What are the experiences of other users in my locality? Is the electric a "bad-weather" car?
2. What special advantages has the electric for me—as a suburbanite with children to take to school, station trips, theater, etc.; as a business man about town; as a professional man, doctor, lawyer, teacher, clergyman?
3. How far can I go? Can I use the car every day? How long does it take to charge it?
4. How much does it cost to operate in my locality?
5. Have you a booklet in which these questions are answered?
6. Is there any one in town of whom I can ask questions?
7. What do I have to watch about the car? Are there special points I ought to know about?
8. How do I know when the batteries are "full"? How do I know when they are empty?
9. Can I buy charging equipment on time as one does an electric washing machine?
10. Can I get the car charged anywhere in town? How much does it cost?
11. How can I charge it at home? Where can I get the equipment? What does it cost? Can I operate it myself?
12. Do I have to have a garage in any way special? Do I have to heat the garage in winter? Is there any difference in insurance rates between electric and gas cars? Can I leave the car standing in winter without danger of its freezing?

His second problem proved to be how to get the car charged, which is, first, one of cost; second, one of methods. His third hurdle was how he could charge his car. Not only must the customer buy the car but a charging outfit.

The owner of an electric truck is in much the same relation to his vehicle as the owner of the pleasure car, the paper continues. The group of questions asked, which were gathered together from several sources, is curiously like the questions the pleasure-car man asks.

There is no more important factor in the successful use of "electrics" than the relation of driver and garage man to costs. If the last penny is squeezed out of drivers' salaries, the trucks will be abused. If costs for garaging are placed so low that there is nothing in it for the garage man, the truck will soon fall to pieces.

Questions the Commercial Car Buyer Wants Answered

1. Are electric trucks used in any business like mine?
   Who are some users that have proved the electric truck's value to themselves?
2. What sizes of electric trucks are made? How much can they carry?
   What size of truck do I need in my business?
   What are inside dimensions of the body?
3. Can I buy the chassis separate?
   Can I use my present delivery bodies?
   Do you (the truck manufacturers) make special bodies?
4. Who guarantees the operation of the batteries—the battery maker or the car maker?
5. What does the truck cost? Are car and batteries sold separately?
   Can I buy an electric truck on time?
6. What is the average mileage of a car under fairly good conditions?
   How much charge does a truck hold?
   Will the truck operate in snow?
7. What are upkeep costs compared with gas-car costs?
   What are operating costs compared with horse-drawn wagons?
   Would it be possible to use two electrics instead of three horse-drawn wagons, each wagon serving about thirty customers and covering a distance of two or three miles? What number of stops can be covered?
8. How shall I get car charged?
   What is the cost of a charging outfit?
   Who will sell me a charging outfit?

APPLICATIONS

Central Station Use of Electric Vehicles

The companies situated in the big cities of the United States have one after another adopted the electric vehicle for nearly all the branches of their work, Arthur Williams points out in his paper, entitled "How and Where Central Stations Can Use Electric Vehicles." The first few cars purchased with the idea of making such an experiment proved so successful that large orders followed, and in many cases all other types of vehicles were displaced. Ten of the companies alone use 650 cars, representing the largest central stations.

But this gratifying appreciation of "electrics" is largely confined to the central stations in the large cities. While instances may be mentioned where they are used in the small towns, these are distinctly exceptions rather than the rule. A large proportion of the smaller central stations and some pretty large ones lack a proper realization of how "electrics" can be applied to their transportation work. The author presents in great detail the practice of the larger central stations, considering the branches of work which are being handled successfully by the electric vehicle.

Applications of Industrial Truck

In a paper entitled "The Modern Applications of the Electric Industrial Truck and Its Earning Power for the Central Station," J. Crawford Bartlett explains the electric tractor idea for industrial applications with a number of trailers and explains how it is to the advantage of central stations to obtain this class of business.

LEGISLATION, STANDARDIZATION, GARAGING AND ACCOUNTS

Standardization

The work of the committee on standardization (E. R. Whitney, chairman) at the present time is largely of an advisory or consulting nature, for the reason that, in accordance with arrangements made a year or two ago, all matters of standardization are being handled by the Society for Automobile Engineers, it having created for this purpose a special division of its standards committee known as the electric vehicle division.

The committee's report consists largely of a review of the work that has been done by this division.

Legislation

It has been the aim of the committee on legislation (P. D. Wagoner, chairman) to combat energetically all unreasonable and unnecessary bills which have come to its attention and to lend support wherever possible to such measures as might be of benefit to the industry. The committee presents in its report a résumé of the more important changes which have been made or proposed in the automobile laws of the various states since the last annual convention of the association.

Operating Records

"Cost Accounting for the Transportation Phase of the Central Station Industry" was the subject discussed by the operating records committee, of which P. E. Whiting is chairman. An outline was presented making possible classification of the cost of operating any type of vehicle in various classes of service for the purposes of comparison. Committee work for the future was also outlined, some of the subjects treated being as follows: Standard classification of accounts, standard classification of statistics for comparison of performance data, form of comparative reports for in-

terchange of information, application of system to typical installation, standard departmental operating methods, and standard system of cost accounts.

The expenses have been subdivided to conform with the broad classification of accounts presented heretofore, the subdivision being broad enough for larger companies and still not burdensome to small companies. To facilitate the interchange of reports the big companies have announced that they will be represented by the following men: New York Edison Company, P. C. Savage; Edison Electric Illuminating Company of Boston, C. H. Hodkinson; Philadelphia Electric Company, G. B. Landwehr; United Electric Light & Power Company of New York City, R. B. Grove; Cleveland Electric Illuminating Company, J. A. Scovell; Consolidated Gas, Electric Light & Power Company of Baltimore, H. B. Lohmeyer; Commonwealth Edison Company of Chicago, E. J. Fowler.

GARAGE AND RATES

The garage and rates committee (C. H. Miles, chairman) believes that the most important requirement for the growth of the electric vehicle industry is the establishment of additional high-grade garage facilities and to that end urgently requests every member company to arrange at least one charging station in the territory served by its line. This charging equipment should preferably be placed in a public garage which gives twenty-four-hour service. It should be in charge of some one thoroughly competent to care for and maintain the batteries and vehicles in proper working condition.

The committee feels that the results obtained in larger centers can be duplicated in smaller communities if the local central station will get behind the movement and provide the necessary facilities.

Reduction in price and lessening in weight of passenger cars has helped their distribution and sale, and satisfaction is now being obtained on a single battery charge. There appears to be little difficulty in selling passenger vehicles in centers where suitable garaging facilities are provided.

As a means of securing larger distribution of charging apparatus, it is suggested that a policy of selling apparatus of this nature to garage owners on a deferred-payment plan be adopted by the member companies. It is thought by the committee that apparatus manufacturers should co-operate by making a concession in price to central stations to cover the cost of selling and handling this business.

At the present time there is a great variety of charging apparatus on the market, and synchronous converters of various sizes which give good efficiency and are reasonable in price are at hand. It is the opinion of the committee that this form of apparatus has advantages which commend its use for general garage service.

The committee has given some thought to the standardization of garage rates, but feels that this is largely a matter for local consideration. There are two methods in force for charging the customer for the care of his car—the first a flat monthly rate covering all expense of garaging including energy, the second a certain fixed sum for the care of the car and an additional sum for the energy used on a meter basis. Both systems seem to have worked satisfactorily in certain sections, and the committee feels that although the second method is the fairer and more equitable, each garage should be left to adopt whichever seems to give satisfaction.

There has been a tendency in certain localities to offer garage service to car users at a price which leads to practically no profit to the garage owner. The result of this means poor service and general dissatisfaction with the electric vehicle.

It is felt that the rates given by member companies for this class of service throughout the country are as a whole satisfactory. A high rate per kilowatt-hour for this purpose tends to hinder the development of the business, and the committee recommends that member companies not now having a preferential rate give consideration to the off-peak character and relatively high kilowatt-hour consumption per unit of this class of business.

The committee has considered the matter of the official sign of the association but has taken no action upon it. It feels, however, that some form of sign should be continued for electric garages and recommends that such a sign be furnished by member companies to garages in their territory conditional upon their service measuring up to a certain fixed standard. This sign should remain the property of the member company and be removed from the garage in the event of unsatisfactory service.

INSURANCE

During the past year the committee on insurance (Day Baker, chairman) has found it impracticable to attempt the securing of a decrease in rates on any of the forms of electric vehicle insurance. Most of the larger users feel that the present rates, which in many cases give the electric vehicle a fair preferential, are reasonably satisfactory and that under existing circumstances these should not be disturbed.

The committee is endeavoring to obtain some reliable data from the police departments of the large cities on the proportion of street accidents due to electric vehicles. Owing to the fact that New York City is the only place where details of this character have been collected for more than a few months, no reliable figures have thus far been obtainable. It is believed that next year's committee will be able to collect and present some interesting figures and facts.

CIVIC USES

FEDERAL AND MUNICIPAL TRANSPORTATION

From every standpoint of economy, reliability and efficiency the electric truck is the logical vehicle for government and municipal transportation service, the committee on federal and municipal transportation (James H. McGraw, chairman) points out. Its dependability under all conditions, its speed, its hill-climbing power, its simplicity of drive and its cleanliness all make it the ideal form of truck for fire department, police patrol and hospital ambulance purposes. For street cleaning, sprinkling, garbage and ash haulage, the electric vehicle's flexibility of operation, economy at low speeds and ability to handle heavy loads give it unique advan-

tages with which no other form of motive power can compete. In government mail and parcel post service, too, electric delivery cars have well demonstrated their economy under every kind of service and weather conditions—in long-haul runs as well as on local delivery routes with numerous stops, both in winter and in summer.

Preceding reports of this committee have described at length the manifold advantages of the electric truck in all these forms of government service, and for detailed data concerning such municipal and federal uses of electric vehicles reference is made to earlier publications of this committee.

With the present trend toward the rapid motorization of all forms of municipal equipment as a matter of local civic pride and progressiveness, and with the makers of gasoline trucks straining every effort to secure this profitable business for their less appropriate products, it is believed that no time must be lost if the electric vehicle manufacturer and central station are to secure a fair share for the electric truck with all its many points of superiority over the gasoline car. The committee urges that immediate steps be taken to go after this valuable municipal business which stands waiting, ready to be diverted to the electrical industry instead of the gasoline interests, if an effort is made to secure it. The central station must be brought perhaps to realize more fully the value of the electric truck business as an off-peak load, and to appreciate that the municipal truck business offers a unique opportunity to drive in an entering wedge for commercial haulage business.

The central station man, it is pointed out, is the logical booster for the electric vehicle locally, and it is the central station man's interest and help that must first be gained if electric trucks are to be put into municipal and post office service in his town. First of all, then, the central station man must be won over to becoming an advocate of the electric vehicle through every channel by which his interest can be elicited.

Besides urging upon the electrical industry this warning concerning the municipal truck opportunity that is slipping through its fingers into the grasp of gasoline competitors, the committee has undertaken the preparation of a booklet designed to inform, in a rather popular way, municipal officers and officials concerning the practical advantages of electric trucks. The text and illustrations for this booklet are submitted in an appendix to the report, and it is recommended that this booklet be issued for the use of central stations which desire to distribute literature concerning the electric car among local city officials, councilmen, politicians and citizens at large.

Under the political system prevailing in most American communities to-day the sale of any commodity to the municipality is fraught with its own peculiar difficulties. But the politician in every case is responsive to his own master, the voting public. It is urged, therefore, that the line of attack for the electric vehicle man who wishes to get, say, the local fire department to install electric truck equipment is through the town's leaders and shapers of public opinion as well as through officialdom itself.

The central station man will, for example, do well to get into touch with the newspaper men. Because of the news value of the idea, they will be glad, the committee believes, to run articles on electric vehicles in city use in nearby towns, and should therefore be encouraged to boost the idea editorially and to secure interviews expressing the opinion of representative townspeople.

Meanwhile plans for electric truck apparatus, the committee suggests, should be discussed with the leading citizens—bankers, lawyers and merchants—and their interest secured in the plan to electrify the fire department. If there is a civic improvement association in the town, its help should be enlisted to make a cleaner, better city through the use of electric equipment. While the public is being told about electric trucks, the electric advocate must keep sustained the interest of the heads of the city departments. The fire chief may be shown pictures of what other fire departments are doing with electric equipment and how it is superior to all other forms of motive power, and the chief of police may learn about the advantages to be derived from an electric patrol wagon.

The effort must be kept up, it is felt, in a sustained campaign, since while a single blast may make little or

ONE OF THE MANY MUNICIPAL USES TO WHICH ELECTRIC TRUCKS CAN BE PUT

no impression on the Council or the city buying power, a week's continuous musket fire of opinions expressed by newspapers and representative citizens will attract the attention of these same politicians, and such a campaign continued a few weeks longer will have the political elements on the run, looking for advice from any quarter concerning the use and purchase of electric truck equipment.

If the electrical industry is to have the share of the municipal truck business to which the superior advantages of the battery-propelled vehicle entitle it, and if the central station is to grasp the opening offered by the municipal field as an entering wedge for the development of a local commercial-car business, the committee feels that quick work will have to be done before this municipal business goes over to the electric truck's competitors. Unless the central station acts at once a great opportunity for present and future business will have passed forever. It is urged therefore that central stations lose no time in starting local campaigns for electric municipal equipment and that manufacturers and central stations afford each other every possible cooperation to facilitate the capture of this important municipal business that rightfully belongs to the electric truck.

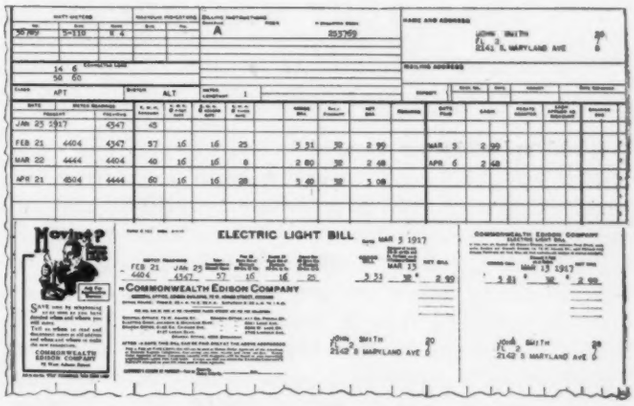
FOURTEEN accounting committee reports were scheduled for the convention, but only seven were submitted by the committees up to the time when the conference was held in New York City. Of these reports two were especially interesting for the amount of information presented—the report for the committee on purchasing and storeroom accounting and the report of the committee on customers' records. The first included information on methods of accounting for tools and methods of following up purchase orders. Inventory of stores was a related report. The report on customers' records traced accounts receivable from the time payments are received to the final balancing of the customers' ledger. Details of a method used by the Consolidated Gas, Electric Light & Power Company for balancing cash receipts daily were included. The uniform classification of accounts and methods of carrying merchandising accounts should be interesting to small and large companies alike, as the requirements of both have been taken into consideration in these reports. Arrangements have been made by one of the accounting committees to assist small companies in their accounting matters. The report of the committee on accounting efficiency is valuable in that it points out how a department covering this subject can eliminate duplication of effort in a company.

ACCOUNTING FOR PAYMENTS RECEIVED

Customers' Records

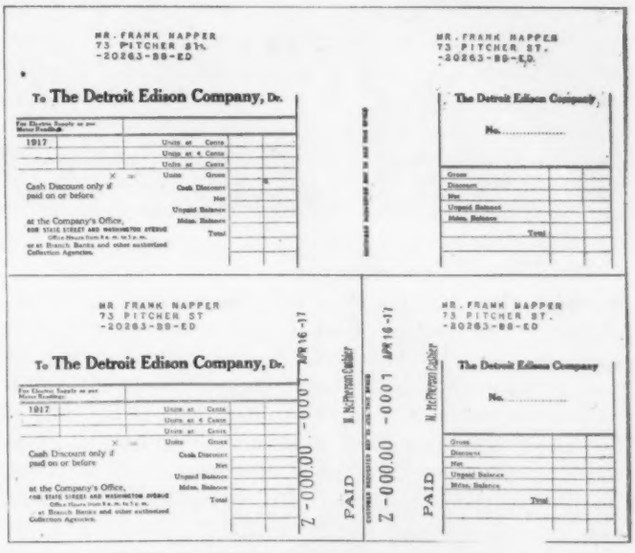
Tracing accounts receivable from the time of receipt of payment to the final balancing of the customers' ledger constituted the principal work of the committee on customers' records, of which E. J. Fowler is chairman. This subject was taken up under the following heads: (1) Compiling aggregate amount of customers' bills rendered and energy sold; (2) proving that all energy sold has been properly charged and billed; (3) handling all cash received in cashier's department and reporting the same to bookkeeper, also whether amount paid is stamped on coupon and automatically accumulated; (4) posting cash to customers' account by bookkeeper; (5) reporting delinquent accounts and drawing of balances; (6) balancing customers' ledger against general control account.

From one hundred satisfactory replies to letters asking questions on the above subjects the following conclusions were made: Regarding subject (1) 12 per cent of the companies replying employed punched cards, 41 per cent used column-listing machines, and another 41 per cent recapitulated the kilowatt-hours sold and net bills, while still others used adding typewriters. Recapitulation was used for other purposes. Bearing on subject (2) most of the companies compared the number of meters with the number of bills, keeping track of removals and installations. Others compared the total kilowatt-hours indicated by the meter reading sheets with the total on the Hollerith cards. The committee recommended checking the record of meters with the meter reading sheet by comparing kilowatt-hours and meter readings as reported on the bills or ledger with the recapitulation of the kilowatt-hours sold.



LEDGER SHEET AND ELECTRIC-SERVICE BILL USED BY CHICAGO CENTRAL STATION COMPANY

About as many companies post cash from the bill stubs as from the recapitulation sheet. It was pointed out by the committee that the latter method is simpler in that large sheets are easier to handle than small stubs. One company is using a machine which cuts the bill stub, receipts the bill, prints the amount paid on both stub and bill and records the total. Various methods were used in reporting delinquent accounts and drawing off balances. Most of them involved the recapitulation of delinquent accounts or of all accounts in the ledger. A method was described whereby billing, ledger posting and recapitulation can be carried on in one operation. Other methods of taking care of delinquent accounts involved the use of collection coupons



FORM OF BILL USED BY DETROIT COMPANY

on bills and the issuing of collection notices. In connection with this subject the committee recommends the careful study of the advantages of some form of recapitulation supplementary to the customers' ledger. In an appendix to the report was an outline of the method used by the Consolidated Gas, Electric Light & Power Company of Baltimore for balancing daily cash receipts.

STOREROOM ACCOUNTING AND INVENTORY METHODS

Purchasing and Storeroom Accounting

Eight subjects are treated in the report of the committee on purchasing and storeroom accounting, of which K. C. Campbell is chairman. Handling and accounting for tools are discussed, and methods of accounting for wagon stock are taken up. The importance of the handling, reclaiming and disposing of scrap is brought out, and details are given of the principal methods employed in handling scrap cable and wire. The report calls attention to some of the common errors in following up purchase orders and tracing shipments of material and shows how this problem is successfully

STEEL COMPARTMENTS FOR STORING SUPPLIES

handled. Some items of storeroom equipment are explained. The need of short cuts in cases of petty cash and emergency expenditures is pointed out, a system now in use being explained in detail. Three classifications of materials and supplies now followed by some of the large companies are also given. A list of items which should enter into the storeroom expense is given. Of three methods described for distributing these items over various accounts the following is recommended by the committee: Analyze the actual expenses over a given period and determine the percentages chargeable to each department, or class of work, on the basis of services rendered, and dispose of estimated future expenses by allocating to each department served a corresponding uniform monthly charge, which may remain unchanged for as many months as is consistent with the services rendered. The committee reports that considerable time was spent on the subject of the "handling of invoices," but in view of the lack of time to collect data on the variety of methods now in use it was decided to leave this matter for the succeeding committee.

The investment in tools used by public utility corporations is considerable and should have thorough supervision. A system of handling and accounting for tools should be used which will prevent overstocking, insure proper distribution, prevent an unnecessary accumulation of tools in the possession of workmen, and permit the exchange of tools of the same size and character between workmen and the tool room without the formality of any papers whatever. Furthermore, all tools of every description, except shop equipment and tools employed only for plant operation, should be charged to a separate material and supplies account. Expenses connected with the operation of the system, such as repairs, replacement, etc., should be charged to a tool expense account, which should be kept separate from storeroom expense, cleared monthly and prorated over all departments benefiting by such service.

In order to carry out this purpose it is recommended that a card record should be kept of all tools. To avoid an excessive number of cards average prices should be obtained by combining the various purchases with amounts on hand. The other portion of the record should consist of a specially ruled loose-leaf record sheet with a number of lines, on which to record the movement of tools to and from the tool room. To avoid opening accounts for all employees using tools this record is limited to foremen, who are held responsible for the care and prompt return of all tools used by their men.

Inventory Methods

New and improved methods of organizing and operating a stores inventory department are prescribed in the report of the committee on inventory methods, of which W. E. Long is chairman. It takes up the functions of such a department, including the relationship of the department to the auditor, purchasing agent and storekeeper. The procedure recommended by the committee represents an advance or improvement over the methods adopted in many storerooms and is developed on a simple basis, calling for trained representatives to work in conjunction with representatives of the storeroom.

The proposed method requires only two forms. The inventory is ordinarily made at least once a year at such times as will cause the least inconvenience to the storeroom force; that is, at a time when supplies are moving slowly. An experienced stores man works with each inventory man, each pair taking charge of a separate section or aisle of the storeroom. The inventory clerk is furnished with a quantity of bin tags numbered consecutively in duplicate, the original being carbonized on the back. The stores man calls the name of the article to be counted, giving such information as will tie it with the description on the stock records. This name is transcribed to the bin tag by the inventory clerk, who repeats it to the stores man. The stores man in turn counts the number of articles in the bin and the inventory clerk records this quantity on the bin tag. The original tag is then placed in the bin and the duplicate is retained by the inventory clerk as a check on the return of the original. All subsequent issues from or

additions to the material in the bin are noted on the original bin ticket by the regular employees of the storeroom.

At the close of business each day the original bin tags are collected and put in numerical order to ascertain that none are missing. The following morning as soon as the previous day's receipts and issues are posted to the stock records and the balance brought down the total quantity shown on the bin tag is compared with the stock-record balances. Any differences are immediately reported to the storekeeper and any adjustments are made on the stock record, his approval appearing on the bin tags showing the differences. These corrections on the stock records are made by the inventory clerk.

CLASSIFICATION OF ACCOUNTS AND EFFICIENCY

Accounting Efficiency

The object of an accounting efficiency department, organization thereof, scope of work and method of procedure, and examples of improved efficiency and economy, were subjects taken up in the report of the accounting efficiency committee, of which H. B. Lohmeyer is the chairman. According to letters received from different companies, about fifty different mechanical devices are used for accounting purposes, the uses of which indicate considerable flexibility in the application of the devices. For this reason it was suggested that the next committee list all the accounting machines and indicate the different methods of applying them. It was pointed out that the object of an accounting efficiency department should be to develop better and more economical methods of conducting business, to co-ordinate activities of various departments with a view toward eliminating duplication in work, and to assist associated departments in analytical and constructive duties when daily routine prevents other departments of the organization performing them themselves.

The department should be organized from the company's forces, should have at its head a man with general knowledge and experience in the various ramifications of the company's activities, and should include men with accounting knowledge backed by common sense, breadth of vision and tact. At least one man in the department should have engineering knowledge and appreciate the operating men's viewpoint.

Standing in the capacity of counsel, the accounting efficiency department should limit its work to recommending changes in practice. In considering any changes the following subjects should be taken into account: (1) Utility of operation performed, service rendered and the reason for existence; (2) effects of discontinuance; (3) if disastrous, consider the best alignment; (4) cost of performing service or obtaining data in relation to utility thereof; (5) possibility of duplication of work and, if so, efficacy and cost of different methods, in order to know which to dispense with. Copies of the department's reports should be sent to the heads of all departments and the chief executive, by whom it should be analyzed.

Uniform Classification of Accounts

The committee on uniform classification of accounts, of which William Schmidt, Jr., is chairman, reports that its efforts have been directed toward the adoption by all public service commissions of a natural uniform standard classification of accounts.

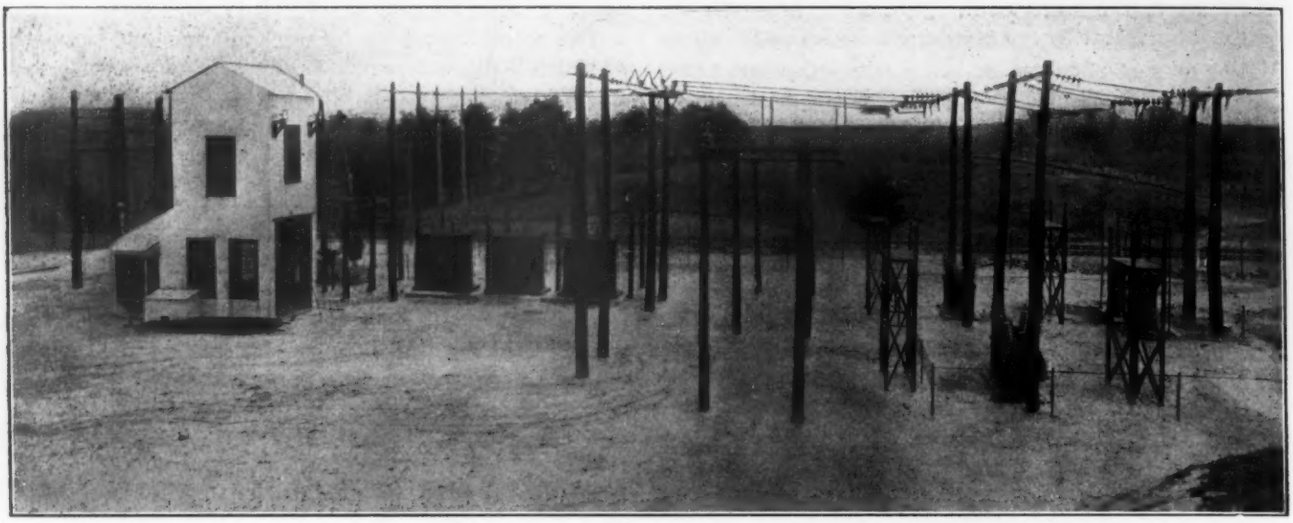
The recommendations of this committee are as follows: That a committee continue the work of this committee, in order that the comparison of the entire classification may be completed at the earliest possible moment; that the association permit this committee to confer with similar committees of other associations whenever in its own judgment it is found desirable to do so (the present arrangement is that the committee on uniform classification of accounts, which is practically a sub-committee of the committee on accounting relations with other associations, must submit its requests to the latter body, which in turn takes them up with other associations, and in this way much time and effort is lost); that a letter be prepared and published showing in detail in what way the smaller companies can make use of the associations' standard classification of accounts. The classification is particularly well adapted to use by small companies, and the methods of use have been pointed out on a number of occasions. The committee mentions that the smaller companies complain that the classification entails too much bookkeeping and is entirely too elaborate. The committee feels that the present classification, with only a few changes, could be adapted so as to fit the requirements of every member company.

Merchandising Accounting

A classification covering the accounting requirements of a central-station merchandising department is proposed by the committee on merchandising accounts, of which L. A. Coleman is chairman. The classification covers the needs of large as well as small companies. The index included in the report will enable the members to select enough of the classification to suit their requirements. The main division consists of the following accounts for the use of the smaller companies: Revenue from merchandise sales, cost of goods sold, cost of installation, selling expenses, general expenses, fixed charges and interest on working capital. Companies desiring more than the six main accounts mentioned may use the first twenty subdivisions thereof, while larger companies may avail themselves of all thirty-nine accounts listed. In this report is also included a suggested form of income and expense statement.

Accounting Service for Small Companies

The committee, of which Frederick Schmitt is the chairman, reports that it has instituted a campaign to develop the committee subdivisions so that through state representation the smaller companies located therein could benefit from the work of the committee in the speediest and most effective manner possible. The committee now has active representation in forty-three states containing 718 central stations operating in cities having a population of less than 25,000. It was recommended that a high-grade man well versed in central station accounting be employed, whose duties would be to visit, upon request, small central stations and, in co-operation with their accounting department, assist in installing standardized systems suitable to their requirements.



Floodlighting Outdoor Substations

How the Difficulties That Were Formerly Experienced in Illuminating High-Tension Apparatus and Wiring Have Been Attacked and Overcome in a Massachusetts Outdoor Station

BY M. M. SAMUELS

EVER since the beginning of high-voltage construction the problem of properly illuminating apparatus and wiring in high-tension rooms has been a puzzle to every engineer who has tried to solve it. Disconnecting switches, buses, fuses and other apparatus mounted overhead must be properly illuminated; otherwise the plant cannot be operated and inspected efficiently or safely. The chief objection against locating lighting fixtures among high-tension apparatus is that the lamps would be inaccessible for replacement or maintenance. Installing reflectors with the reflecting surface facing upward is equally impracticable, since the reflectors would collect dust and dirt rapidly and thus lose their efficiency. The method usually employed to illuminate open-work high-tension apparatus has been to install lamps without shades on walls or columns and depend on the upward radiation of light for illuminating overhead apparatus. Aside from the inefficiency of this method, the glare of the unprotected lamps has always been a just cause for complaint from operators, even when frosted bulbs were used.

With the advance of outdoor construction within the last three or four years, the problem of illuminating high-tension equipment has become more difficult, since poles in outdoor stations are usually far apart. Fixtures cannot be installed anywhere, and walls are not available at all. Air-break switches and lightning-arrester gaps are always placed at a great height, and their illumination is of far greater importance than the illumination of indoor apparatus.

EQUIPMENT ILLUMINATED

On page 995 of the Nov. 18, 1916, issue of the ELECTRICAL WORLD the writer first suggested that floodlighting be tried out for outdoor stations. Since then an opportunity was afforded for applying this idea, and it may be of interest to engineers to hear that the installation has proved very satisfactory. The station which was illuminated belongs to the Leominster Electric Light & Power Company, Leominster, Mass. Several day-time and night-time views of the station are shown herewith to indicate the position of the lighting units and the satisfactory results obtained with artificial illumination. The station proper occupies a ground space measuring approximately 170 ft. by 70 ft. At present the installation consists of two 66,000-volt incoming lines with corresponding oil switches and disconnecting switches and electrolytic lightning arresters, two sets of pole top air-break switches with their mechanisms, one bank of three 1000-kva., 66,000/13,200/2300-volt single-phase, self-cooled transformers, one set each of 13,200-volt and 2300-volt oil switches and metering equipment and one 2300-volt outgoing feeder. Provision was made for another bank of transformers and 13,200-volt electrolytic lightning arresters, four 13,200-volt feeders with their air-break switches and three additional 2300-volt disconnecting switches. As shown by the illustrations, all of the overhead equipment is supported by

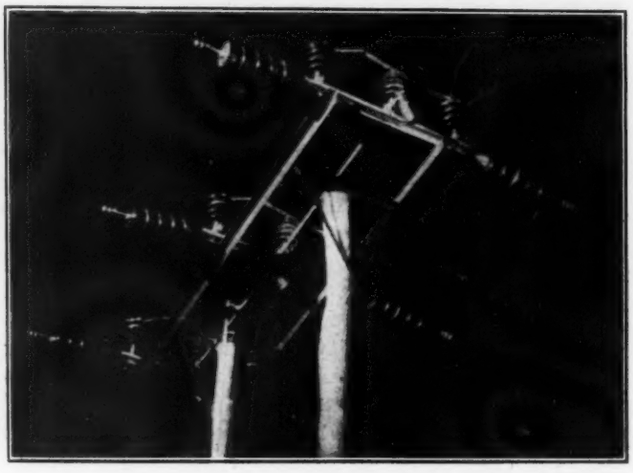


FIG. 1—POLE-TOP EQUIPMENT ILLUMINATED BY FLOODLIGHT AT LEOMINSTER, MASS.

wooden poles with angle-iron cross-arms. The 66,000-volt wiring is supported by strain-type insulators, while the 13,200-volt and the 2300-volt circuits are supported on pin-type insulators. Solid, not stranded, wire is em-

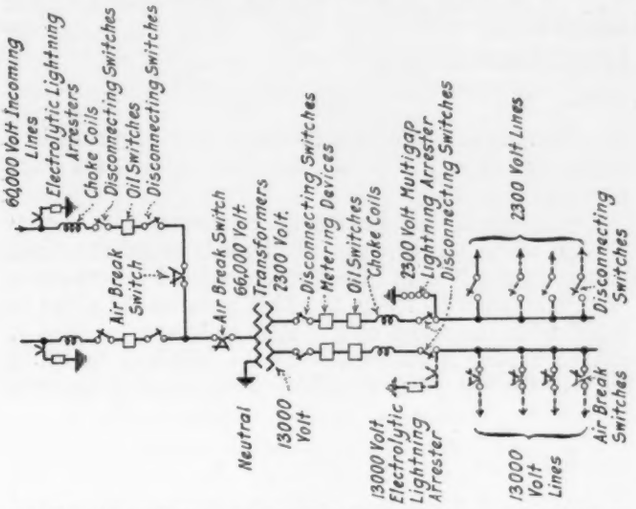


FIG. 2—CONNECTIONS OF ELECTRICAL APPARATUS EMPLOYED IN OUTDOOR SUBSTATION

ployed for the 13,200-volt buses and copper pipe for the 2300-volt buses. The high-tension airbreak switches are approximately 35 ft. above the ground.

Near the low-tension end of the station and adjoining the operator's house is a transformer repair tower which affords a very convenient place for mounting the floodlight projectors. Directed toward the 66,000-volt end of the station, which is furthest from the transformer repair house, are two General Electric type L-1 projectors having a beam angle of 16 deg. These units are mounted on the corners of the transformer repair tower as shown in the accompanying illustration and adjacent to the transformer territory, two General Electric type L-3 projectors are mounted on the corners of the transformer tower nearest the equipment to be illuminated. These units have a beam angle of 50 deg.

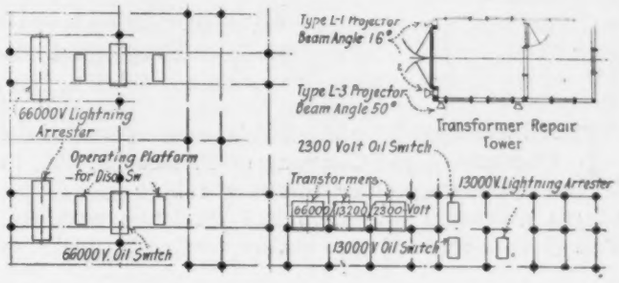
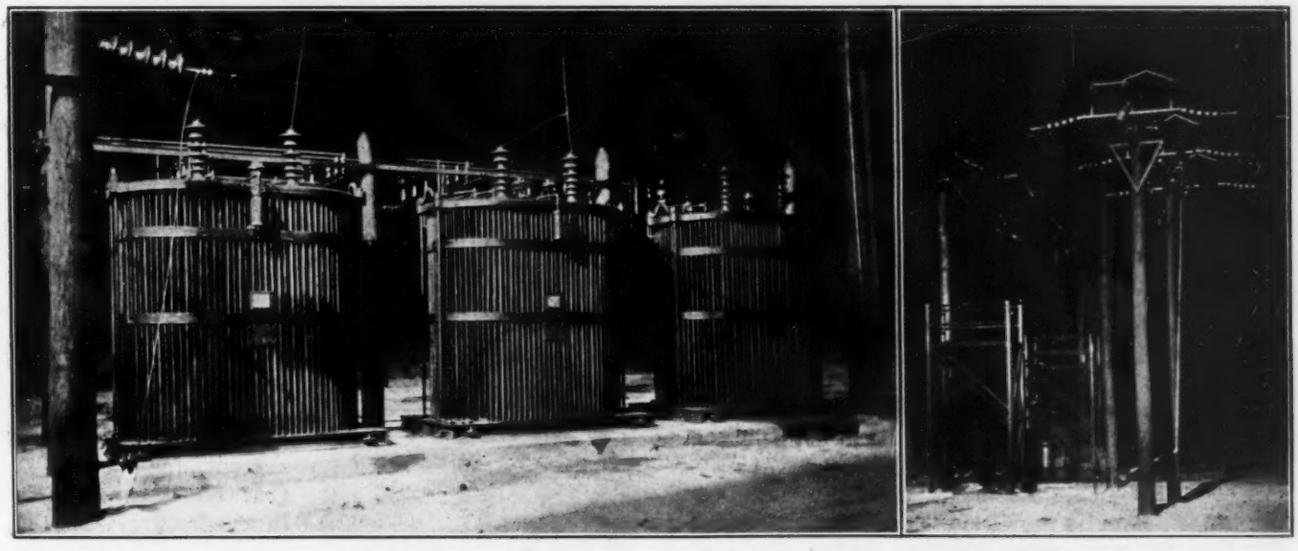


FIG. 5—POSITION OF FLOOD-LAMPS WITH RESPECT TO STATION EQUIPMENT ILLUMINATED

Projector lamps rated at 500 watts are used in both types of projectors.

RESULTS OBTAINED

The entire station is excellently illuminated, the light distribution being about as uniform as it could be made with direct or indirect lighting. Although the contrast desired to make small objects readily discernible has been obtained, no deep shadow concealing important equipment has been produced. At a distance of 150 ft. from the projectors the smallest type can be distinctly read and the stamped lettering on the apparatus name plates stands out very clearly. The details of the pole-top apparatus can be discerned more clearly with artificial light than in daylight, as shown by the illustration, because the objects observed are brighter than the broad expanse of sky back of them. No glare, which would be a hindrance to efficient station operation, is experienced anywhere in the plant due to the floodlight illumination. It may be added that the cost of installing



FIGS. 3 AND 4—EFFECTIVENESS OF FLOODLIGHTING SHOWN BY DISTINCTNESS OF DETAILS IN TRANSFORMER INSTALLATION AND POLE-TOP EQUIPMENT

illuminate an area approximately 50 ft. wide and 175 ft. from the projector, the average intensity being about 3 ft. candles. From this performance it is evident that this type of projector is particularly adapted to illuminating long, narrow stretches of high-tension apparatus each side of the station center line. To illuminate the low-tension equipment, which, as mentioned before, is floodlighting equipment for outdoor stations is a great deal less than that of any other form of illumination.

Considering the conditions mentioned and the results obtained, floodlighting may be recommended as the only practical and efficient method of illuminating outdoor stations. The installation described was made by the J. G. White Engineering Corporation.

Testing of Linemen's Rubber Gloves

Arrangements Provided by Pittsburgh Operating Company for Testing Gloves Bi-monthly in Central Laboratory—Method Employed and Data Secured

BY C. W. WARD

THE widespread "safety-first" movement has led the Duquesne Light Company of Pittsburgh, Pa., to adopt among other things a rubber glove that affords maximum protection and maximum usability. This glove is made of pure rubber varying in thickness

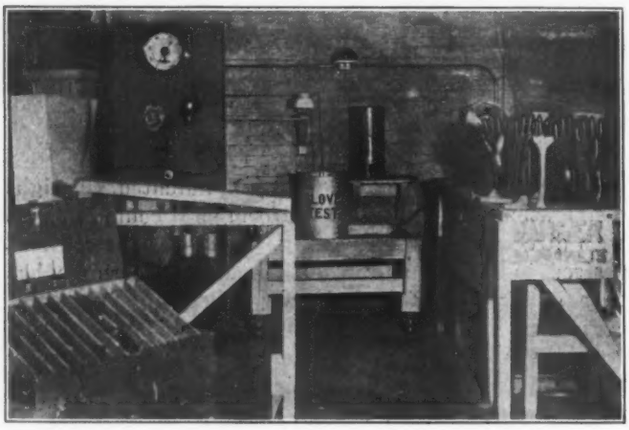


FIG. 1—OUTFIT USED IN TESTING RUBBER GLOVES

from 0.038 in. to 0.040 in. (0.97 mm. to 1.02 mm.), having a guaranteed dielectric strength of 10,000 volts and actually withstanding 18,000 volts. Over the glove is worn a horsehide glove, which protects the rubber one from mechanical abrasion.

So that the interests of the users of these gloves can be thoroughly safeguarded, the Duquesne Light Company has installed in its laboratory the necessary equipment to give all gloves an acceptance test upon their receipt from the manufacturer and to give periodic tests to the gloves after being issued for service. All used gloves are tested bi-monthly and must withstand the same test as when new. The linemen, operators and other glove users are compelled to exchange the pair they have in their possession for a new or tested pair on each semi-monthly pay day before their pay vouchers are given them. The gloves to be tested are transported from the various districts to the laboratory by the general storeroom truck on its regular delivery days. For this purpose each district has a rugged box in which are two or more trays, one above the other, each divided into a dozen spaces 15 in. long by 2 in. wide and 5 in. deep (38.1 cm. by 5.1 cm. by 12.7 cm.). A pair of rubber gloves fits snugly on edge in each space. The hinged cover is provided with a hasp and padlock, while inside on the cover are two spring clips under which the tester at the laboratory slips his report of the test on the particular quantity of gloves for the information of the district superintendent. A box with its top tray tilted is shown in front of the railing in Fig. 1. Each used pair of gloves successfully passing the test imposed is placed in a specially made envelope 14½ in. long by 4 in. wide (36.8 cm. by 10.2 cm.), with the gummed fly on the end. Thus inclosed they are placed on edge in the trays, one in a space. The lineman or operator receiving a pair of gloves in a sealed envelope knows at once that they have been properly tested.

The apparatus for making the necessary tests is simple, but complete. One pair of gloves is tested at a time, being slipped into a specially constructed holder made of copper, shown in Fig. 2. This permits the glove to stand with the wrist or gauntlet end open, so that it can be readily filled with water to within 1 in. (2.54 cm.) of the top. For convenience in filling, a spigot is used on the tank shown against the wall in Fig. 1.

The glove holder is immersed to within an inch of its top in an iron bucket of water. Ten thousand volts is applied between the water inside the gloves and that on the outside. The transformer is located on the floor behind the switchboard, its high-tension insulators being visible in Fig. 1. The voltmeter shown on the switchboard is connected to the 110-volt or low-tension side of the transformer, but its scale is calibrated to give the corresponding high-tension voltage. A rheostat is connected directly across the 110-volt line and arranged to give an unbroken range of voltages from zero to full rated potential of the primary winding.

When the testing of rubber gloves was first started on a large scale investigations were conducted to determine both the charging and the leakage currents of the gloves under test. It was recognized that the water inside the glove separated from that outside the glove by a rubber wall constituted a condenser, and that the charging current together with the leakage current could be indicated on a milliammeter in the high-tension circuit. The instruments used for these tests included a very delicate pivot-type indicating milliammeter and wattmeter. The wattmeter does not indicate the charging component of current, for the reason that this component is in quadrature with the voltage.

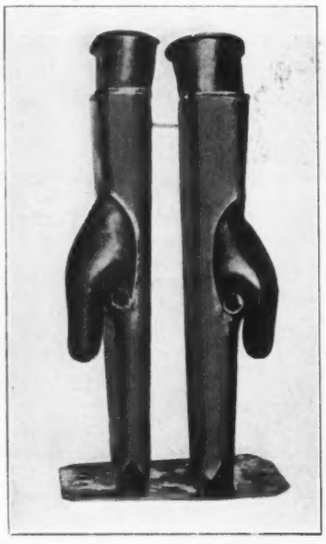


FIG. 2—SPECIALLY CONSTRUCTED COPPER HOLDERS FOR TESTING GLOVES

From tests made on a dozen pairs of gloves the average total milliamperes per pair was found to be 17.13 and the average total leakage per pair only 0.25 milliampere. The average energy leakage of a pair was 2.51 watts. These tests were made at 11,000 volts and with a frequency of 60 cycles. At 25 cycles the total current per glove, including charging and leakage, would be 7.14 milliamperes, and at 133 cycles it would be 37.01

milliamperes. The leakage current would be the same proportion of the total current as with the 60-cycle tests. The leakage currents have been found so negligible that it was decided that any glove which would stand the 10,000-volt test for one minute is a safe one to use. When a glove breaks down under this test a quick-acting circuit breaker in the low-tension circuit of the transformer gives the necessary protection to the equipment.

After a test the water in the gloves is poured back into the open tank. The gloves withstanding the test are placed on the wooden stands shown and allowed to drip, the fan being run to assist the drying. After being thoroughly dried both inside and outside with dry towels and with powdered soapstone shaken in them the gloves are ready for the envelopes, the box and for service. While the periodic tests do not eliminate all defective gloves in service, they do reduce the number to a minimum. The cost per pair per test is about 3 cents and is an expenditure fully warranted.

Meeting the High Price of Coal

How the Electric Service Company at Centerville, Md., Supplemented Its Steam Plant Equipment with a Crude-Oil Engine to Anticipate the Increasing Cost of Coal

BY L. D. SHANK

Manager Centerville (Md.) Electric Light Plant

ABOUT a year ago the writer saw the handwriting on the wall, that is, the increasing cost of coal and the possibility of its going much higher. With this in mind, the situation was studied and various motive powers were considered to take the place of the steam apparatus used. The power plant served both an electric and water system, furnishing electricity for lighting and pumping the water for fire protection. The pumping is done principally with electrically driven pumps, although one large steam pump is used. Being much more economical than the steam pump, the motor-driven pump is employed to do practically all of the pumping, even though the plant is steam-operated.

In the study which was made it became obvious that the only practical way out of the situation would be to use oil instead of coal. However, the price of oil delivered precluded the use of oil burners under the boilers. Therefore it was decided to purchase an oil engine, a 125-kva. direct-connected generator with belt-connected exciter being selected. While arguments have been advanced that four-stroke-cycle engines are more economical in fuel and lubricating oil on light loads, the two-stroke-cycle type was chosen, as it was considered best for small installations and had the additional advantage that it could be started quickly and would emit very little smoke from its exhaust. Among other reasons for selecting the two-stroke-cycle engine are the following: Reliability, fewer parts to get out of order and repair, relatively small attention required, ability to run for a long period without stopping (which does not seem to be possible with the high-compression type), and possibility of employing inexpensive labor without sacrificing economy of operation.

The engine selected is a three-cylinder, vertical, two-stroke-cycle, hot-ball, ignition-type Mietz engine. The cooling water is evaporated into steam in passing through the engine jacket and is allowed to enter the cylinder with the explosive mixture and pass out with the exhaust gases. This process helps to keep the cylinder walls and piston well lubricated, eliminates the necessity of using a large amount of cooling water, prevents reduction in efficiency due to using excess cooling water, and makes tanks and a complex circulating water system unnecessary. Moreover, the cylinder temperature is maintained constant under all load conditions so that the engine can operate at its highest efficiency.

The fuel oil is injected into the cylinders by an injection pump through a simple distributor. The governor acts directly on the injection pump regulating the speed by altering the amount of fuel used. Regulation as good as is usually secured with the best steam engine is being obtained. Unlike the steam-engine-driven generator which the oil-engine set replaces, the latter can be paralleled with the other steam equipment readily, and operated in multiple indefinitely. By retaining one complete steam set it is now possible to operate with either steam or oil and give twenty-four hours' service.

In supplementing the steam equipment with oil-engine apparatus several problems arose. Probably the most important one was how to maintain continuous service should the engine stop suddenly, it not being desirable to bank fires under the boilers. This difficulty was overcome by water-jacketing the exhaust pipes from the oil engine and circulating the water through one of the 125-hp. boilers. In order to do this the exhaust pipe from each cylinder was extended 8 ft. (2.4 m.) and a larger-sized pipe slipped over it and secured concentrically therewith by packing glands at each end. The arrangement employed is shown in an accompanying illustration.

With this provision it is possible to maintain the water in the boiler at or near the boiling point, so that with the firebox filled with wood and oily waste steam can be raised in thirty to forty minutes. This arrangement also eliminates the expenditure ordinarily involved when fuel must be used for banking fires, and the heat ordinarily lost through the engine exhaust is utilized. Furthermore, the water surrounding the exhaust pipe tends to cool and contract the hot gases, thereby reducing the back pressure considerably.

Eliminating smoke and noise from the exhaust was another problem of considerable importance. While a large cast-iron muffler was furnished with the engine and eliminated most of the noise on light load, it became very noticeable on quiet nights when the engine was operated at full load. In order to avoid this difficulty, the engine exhaust was connected with an old brick stack which formerly served two small boilers (one of which

has been taken out), thus requiring the exhaust gases to pass up the stack before expanding completely, and also deadening the noise almost entirely. So that this arrangement would not increase the back pressure an injector was constructed between the muffler and the pipe leading to the stack. This arrangement produced very satisfactory results. Occasionally the soot is allowed to burn out even up to the brick stack, a continuous occurrence of this kind being prevented normally by admitting water to the cast-iron muffler.

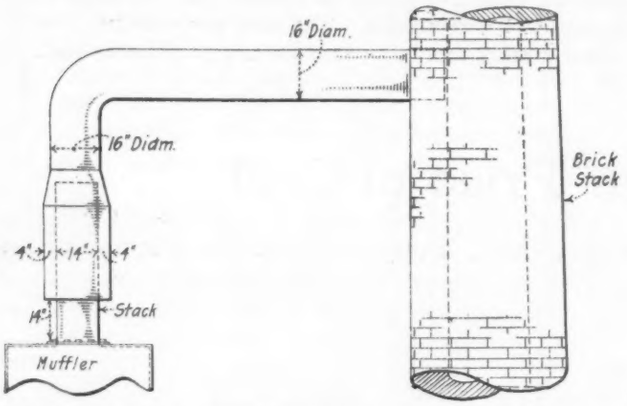


FIG. 1—METHOD OF CONNECTING ENGINE EXHAUST WITH OLD BRICK STACK TO REDUCE NOISE

The oil used in this plant is received by gravity from tank cars through a 2300-ft. (701-m.) pipe. With average temperatures (temperature affecting the viscosity of oil) a car can be unloaded in five hours, the elevation of the railroad above the tanks being 50 ft. (15.2 m.).

The installation has proved entirely satisfactory from every angle. As far as economy is concerned, the saving over steam operation—that is, the saving in coal—is quite an inducement to use the oil engines even when coal is at normal prices. When abnormal prevail, as in the last few months, the saving is enormous. Even if the price demanded for coal could be paid, it would have often been difficult to get a sufficient supply of fuel.

With coal at the average price of $4 a ton, the steam plant burns $20 worth of fuel in twenty-four hours. Added to this expense is the labor cost of employing one fireman at $2 a day. The general upkeep expense is estimated at $200 per year, not including natural wear and depreciation of the plant as a whole. Included in this expense are such items as firebrick, labor, packing, gaskets and various small items.

With the oil-engine set the average upkeep expense is $100 per year. In fact, this is liberal, for it is difficult to foresee where $25 can be spent on upkeep, since no packing is required except for the gaskets, cylinder heads and plates, about the only replacements necessary being for small items such as broken pipe connections or petcocks. The average fuel consumption of the oil engine is 140 gal. (529.9 l.) per day. Thus with oil at 6 cents per gallon delivered, the fuel cost is $8.40 per day, in contrast with $20 per day for coal. Operating with twelve-hour shifts, two men are required in the plant. The long hours may appear to be a hardship on the men, but wakefulness is the main requirement.

The oil engine installed costs more than a corresponding steam engine and generator and about the same as a four-stroke-cycle engine of the high-compression type. The low upkeep expense and the reliability of the engine more than offsets the extra fuel consumed, a two-stroke-cycle engine being somewhat less efficient than a four-stroke-cycle engine.

Extraordinary conditions in the coal market have made this installation a most profitable venture. Instead of saving $14 per day as would have been the case under normal conditions, about $32 per day is saved, this amount being based on figures for five months.

The adoption of oil-engine drive was not prompted alone by the unusual condition in the coal market. By watching conditions and estimating the probable duration of the war it was figured that the railroads would be deluged with work, causing labor to be high and scarce at the mines, and that for several years at least it would be difficult to fill coal bins at any price.

While the installation of this plant has been regarded as radical and reckless by some engineers, and the plant has been watched day and night for the slightest failure that might indicate the fulfillment of prophecies, there has not been a single shutdown. It has been possible to maintain continuous service while other power-plant operators have suffered interruption to operations or are borrowing money to buy coal.

Although the results obtained lead the writer to believe that the Mietz engine direct-connected to a Westinghouse generator is the most reliable set for small stations, it is probable that some other type of prime mover might prove better, because of the fuel saving permitted, if a unit as large as 800 hp. or 1000 hp. had to be installed. The success obtained with this installation indicates that more small plants, either municipal or privately owned, would do well to consider using oil engines for their central stations, even where they do not require them as auxiliaries to large powers. This is particularly true in small plants, which do not have the trained forces of larger ones for studying operating problems. This article was prepared in the hope that other operators in small central stations will come forward with their experiences and that a discussion will arise regarding operating problems relating to plants ranging from 100 kw. to 500 kw.

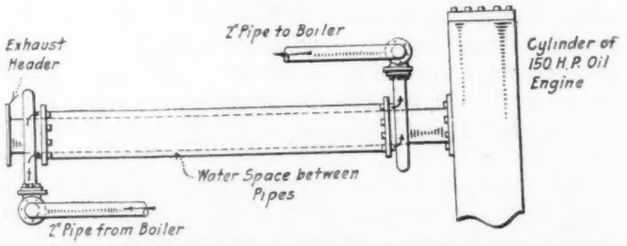


FIG. 2—WATER CIRCULATED AROUND EXHAUST PIPE TO REDUCE BACK PRESSURE AND AVOID NEED TO BANK FURNACES

Oil-Immersed Key for Wireless Transmission

Where the primary current for wireless telegraphy is large, difficulty is experienced in operating the transmitter key at high and even at low speed. Frederick G. Creed of Croydon, England, in patent No. 1,218,062, suggests the use of oil-immersed contacts. To this end two mercury cups are provided in the oil chamber for leading in the current. The current is broken by a lever one end of which is immersed in one of the mercury cups while the other makes contact with a rotating disk having an annular boss immersed in the second mercury cup. Thus quenching of the arc is most effectively attained.

STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

JOINT CONSTRUCTION OF LINE

Transmission Line Built by Arrangement Between Central Station and Hydroelectric Company

The Fitchburg (Mass.) Gas & Electric Light Company and the Connecticut River Transmission Company recently constructed a transmission line under a joint arrangement, each company furnishing its own power to its own customers. The agreement provided that the Fitchburg company should pay all the costs of constructing a 33,000-volt line from Fitchburg to Townsend (except the cost of copper, which the transmission company would supply). On half the cost (including that of right-of-way) the transmission company is to pay the Fitchburg company 15 per cent per year. To avoid the necessity of duplicate investment in copper for the line, it was agreed between the two companies that the transmission company would supply all the power required by the other company for its own customers in Townsend. The Fitchburg company is to return from time to time an equivalent number of kilowatt-hours at the Fitchburg substation of the transmission company plus sufficient kilowatt-hours to compensate for line and transformer losses. The line mentioned is about 8 miles (12.8 km.) long.

ADJUSTING COMPOUNDING

How Shifting the Brushes May Suffice if the Generators Are Not Operated in Parallel

BY E. C. PARHAM

Sometimes where one tap of a series field shunt "compounds" too much and the next tap too little the exact voltage desired under the given load conditions may be obtained by shifting the brushes. If a generator is to be operated alone there is no objection to this method of changing the voltage characteristics, but if the machine is to be operated in parallel with another generator it is better to adjust the compounding by means of the shunt with all brushes on neutral. This is true since if two machines are compounded under different brush positions and shunt conditions the machines will fail to divide the load proportionately when operated in parallel. Under no condition should the brushes be shifted enough to cause serious sparking under either load extreme.

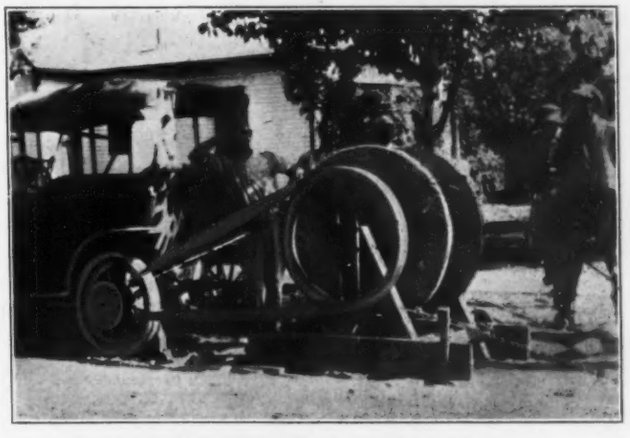
Considerable trouble had been experienced with the commutation of a large multipolar generator that was operated in parallel with a more modern machine. The machines divided the total fairly well, but the brushes of the older machine sparked just enough to prevent the commutator from developing a polish. As the brush holders were old and worn, it was decided to install a more recent type. After applying the new holders the commutation was somewhat improved, but it was noticed that the machines did not divide the load in the same ratio as they had done before the change was made. The situation was not serious, because the total capacity was much greater than the demand at that time. As it was purposed to increase the load later, however, the matter was investigated.

The trouble was found to be due to a difference between the overhang of the new and that of the old holders, the new ones being shorter and thereby shifting the brushes off neutral. On shifting the holders about one and one-half bars forward in the direction of rotation not only was commutation perfected but satisfactory load division was restored.

FORD CAR USED TO REEL WIRE

Rear Wheel of Car Belted to Cable Drum and Arrangements for Removing Coils from Reel

Eight blocks of No. 4/0 copper wire were taken down and reeled with the use of a Ford car by H. W. Cox at McCook, Neb. The arrangement employed is shown herewith. One rear wheel of the automobile was jacked up and supported so the car could not move but so that the elevated wheel would turn. A drum, wide enough to accommodate the belt used, was then attached to the spokes of the wheel and provided on the outer side with a disk to prevent the belt slipping off. To obtain the torque required, a large pulley was fastened on the end of the shaft carrying the cable reel. The axle was supported on A-frames attached to a common base that could be easily transported. This was held in line by stakes driven into the road. Adequate belt tension was secured by driving iron pins into the ground several feet from the cable-reel base and connecting them therewith by chains and turnbuckles. To permit removing the wire after it had been coiled the cable reel was modified as follows: One end was separated from the drum and a loose sleeve fitted over the drum. Thus after the wire is coiled the sleeve can be slid off, the wire easily removed and the reel put in service again.



WIRE REEL DRIVEN FROM AUTOMOBILE WHEEL

DRYING GENERATORS

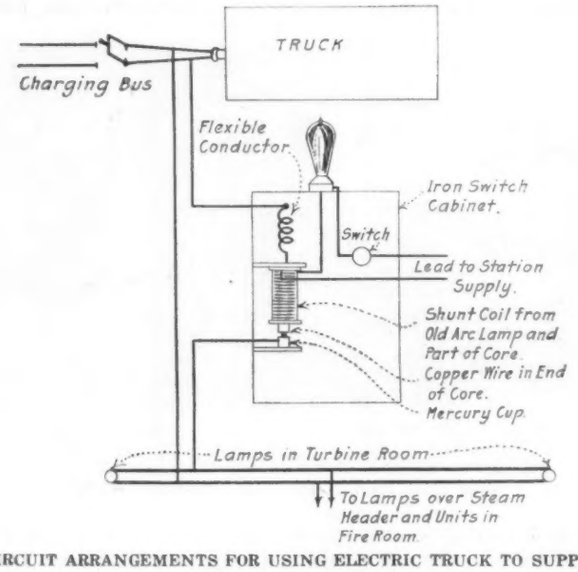
Method of Applying Low Voltage to High-Voltage Windings to Drive Out Moisture in Insulation

Owing to the atmospheric conditions close to the ocean, the generators at the Redondo plant of the Pacific Light & Power Corporation have to be dried out periodically. Since the armature windings are connected in "star" with the neutral grounded the drying-out operation may be performed by connecting two terminals of each generator to one side of a 440-volt circuit and one terminal to the other side. While this arrangement does not give an equal amount of current in each phase winding, it was found to be suitable for the voltage available and provides sufficient heat to keep the windings dry without an excess of current in any one winding. Disconnecting switches are arranged so that it is impossible to connect the generators to the high-tension buses until the dry-out connection is open. The temperature of the windings varies according to atmospheric conditions and ranges between 35 deg. and 46 deg. C. About 500-kw.-hr. per day per generator is required for this purpose. As three 18,000-volt generators are dried out together, the load on each phase of the station auxiliary transformers may be fairly well balanced. This scheme was brought out by Don D. Morgan of the Pacific Light & Power Corporation in a paper recently presented before the Pacific Coast Section of the N. E. L. A.

EMERGENCY STATION LIGHTING

Truck Battery Used as Reserve Energy Source at Night When Vehicle Is Not in Service

The Citizens' Light & Power Company of Adrian, Mich., is using one of its electric trucks as an emergency source of energy for station lighting. The truck,


TRUCK
Charging Bus
Flexible Conductor
Iron Switch Cabinet
Switch
Lead to Station Supply
Shunt Coil from Old Arc Lamp and Part of Core
Copper Wire in End of Core
Mercury Cup
Lamps in Turbine Room
To Lamps over Steam Header and Units in Fire Room

CIRCUIT ARRANGEMENTS FOR USING ELECTRIC TRUCK TO SUPPLY EMERGENCY LIGHTING

which is of the light delivery type operating on a potential of about 100 volts, is connected to the emergency lighting circuit of the power house each night and disconnected each morning. Otherwise the operation of the emergency system is automatic.

As shown in the accompanying sketch, a pair of leads is tapped into the circuit between the charging-bus switch and the truck plug. One of the conductors extends directly to one side of the station-lighting circuit. The other is passed through a home-made contactor. This latter consists of an old arc-lamp shunt coil which is connected so that it is energized as long as the regular station-lighting supply line is energized. Should service on this circuit be interrupted the coil will be de-energized and its core will drop so that the emergency circuit is closed through a flexible conductor, a copper wire running through the core and a mercury cup beneath. The establishment of this emergency circuit lights two lamps in the turbine room, one lamp over the steam header and one in the fire room.

In commenting on this use of an electric truck H. A. Fee, president of the Adrian company, said: "While we have had no use for emergency lighting during the last two years, it is a great comfort to know that if the supply fails the operators will not have to stumble about in the dark hunting for lanterns."

BALANCED DRAFT FOR EMERGENCY NEEDS

How a Fully Loaded Power Plant Was Enabled to Carry 200 Per Cent Load Without Increasing Its Boiler or Stoker Equipment

BY ALBERT MARTINEAU

The unprecedented demand for certain products which has resulted from the European situation and the accompanying profits have caused the establishment of numerous manufacturing plants in various parts of this country. Some of these have "sprung up over night," so to speak, to be used only under present conditions.

Increase in power-generating facilities was needed recently in a steel plant, and needed quickly. The load was such that an increase in boiler capacity of 25 per cent had to be obtained continuously and 100 per cent occasionally. The plant consisted of six 250-hp. Stirling boilers equipped with chain-grate stokers firing Illinois screenings and washed slack—a bituminous coal high in volatile matter, ash and moisture. Natural draft was used. It was out of the question to await the installation of additional boilers and stokers owing to the delay incident to installing them, and to the inability to obtain immediate delivery. Moreover, this method of obtaining the increased capacity was undesirable since the cost of doing so would be high with the prevailing prices of steel and apparatus.

As a result, the problem was attacked with a view to obtaining the desired increase in capacity with the use of existing apparatus and by improving operating conditions. Since the limitations in output were partly due to scant chimney capacity the first thing to do was to extend this, not by increasing its height or volumetric capacity (operating conditions and the foundation would not permit this), but by reducing the volume of gases it was called upon to handle. With this in view two Orsat testing sets were installed on one of the boilers, one for the gases at the top of the first pass and the other just ahead of the back damper at the top of the last pass. These meters showed that not only was the chimney being greatly overtaxed by excess air due to infiltration from a boiler setting, but also from careless

firing. The test also indicated that, based upon the analysis of the coal combustion, efficiencies were far from what might reasonably be expected—a particularly undesirable condition where increased capacities were desired, apart from the loss resulting from such an uneconomical manner of operating.

As a result of the investigation the settings were repaired, the heating surfaces were cleaned, and a test run was made with the boiler and furnace in charge of the boiler-room force. While the efficiency improved the limitations imposed by the stack still prevented attaining the capacity desired. This had been expected, however, so while one boiler was shut down for overhauling an automatically controlled motor-driven blower was installed, the blower being controlled by a gas-pressure damper regulator which in turn was controlled by pressure of the gases in the furnace. The equipment was like that described in the Sept. 20 and Oct. 19 issues.

Tests were then made with balanced draft, using the same coal as used previously; also with a better grade of coal, it being thought that it might be advisable to use a more expensive coal to obtain the occasionally high rating, namely, 200 per cent. It was found that owing to the absence of air infiltration the CO_2 increased from 6.9 per cent to 11.9 in one case, and to 12.4 in the other. This change, together with the accurate control of the air supply according to the requirements of the fire, reduced the gases handled by the chimney to such an extent that it was found feasible to operate this boiler at 200 per cent of rating with comparative ease, notwithstanding the fact that some of the other boilers were using the chimney, too, with their large quantity of excess air.

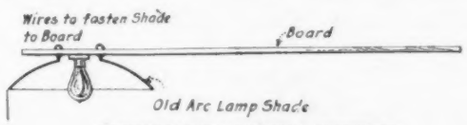
In the present instance, the adoption of balanced draft was so successful in increasing the combustion efficiency, the capacity of the boiler and the capacity of the stack that a similar change is being undertaken under the remaining boilers. This will considerably increase the capacity of the plant, continuously, as well as for carrying peak demands, and will also increase the water evaporation per pound of coal. Installation of economizers is now under consideration, since they will still further increase the over-all efficiency of the plant.

USING OLD ARC-LAMP SHADES

Reflector and Incandescent-Lamp Receptacle Fastened to Board for Temporary Illumination

BY C. B. DEAN

In the accompanying illustration is shown a method of utilizing old arc-lamp shades for temporary flood-lighting. The reflectors were taken from arc lamps



TEMPORARY LIGHTING FIXTURE

that had been discarded, each shade being fastened to a board which was not as wide as the diameter of the reflector. A gas-filled lamp receptacle was also fastened to each board and the leads were left long enough so that they could be tapped on a circuit within reasonable distance. The outfit was fastened to a tree or post. A narrow board was used to permit good ventilation.

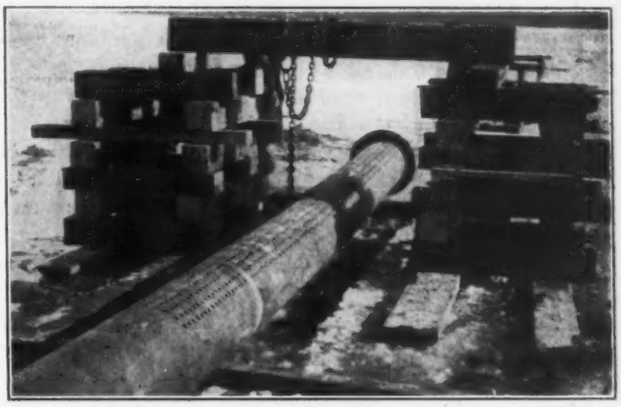
INSTALLING SUCTION LINE

How a Circulating-Water Line Was Constructed and Lowered into a River, with Data on Cost Thereof

BY G. T. SHOEMAKER

United Light & Railways Company, Davenport, Iowa

Delayed delivery of material saved the Muscatine Lighting Company, Muscatine, Iowa, a considerable amount of money in installing an 18-in. (45.7-cm.) circulating-water suction line, which extends 200 ft. (60.9 m.) from the power house to the Mississippi River, and an additional 200 ft. (60.9 m.) out into the river. It was originally intended to have a contractor install the entire pipe line, at a cost of $4,000, the plan being to lower the pipe into the river with the help of boats.



SUCTION PIPE READY TO SUBMERGE

When the material arrived, however, there was 22 in. (55 cm.) of ice on the river, so the operating company decided to do the work itself. Accordingly the pipe was dragged to the desired location and welded together. In order to conform with the government's requirements, it was necessary to place the line several feet below the river bottom. Since there was only 5 ft. to 6 ft. (about 2 m.) of water in the section of the river where the pipe had to be buried, a strip of ice was cut out and the mud bottom scraped with special tools made for the purpose. After the trench was ready the line was moved to a position directly over the trench and supported every 50 ft. (15.2 m.) by bents. To form a sort of strainer at the outer end of the pipe 1600 holes were cut in the upper half of the pipe with a cutting torch. The end of the pipe on shore was then sealed, and by submerging the strainer end it was possible to let the pipe down gradually into the river trench by regulating the flow of air from the upper end of the pipe.

Using men employed by the company, the actual material and labor cost to complete the work, exclusive of pipe cost, was $1,515, a saving of $2,485. This figure includes tunneling under two railroad tracks. Care was taken to obtain accurate expenses, the chief unit costs being $1.05 per cu. yd. ($1.38 per cu. m.) of main ditch excavation, $2.60 per cu. yd. ($3.42 per cu. m.) for tunnel excavation, $2.65 per foot ($8.83 per m.) for timbering in tunnel (47 ft. (14.3 m.) total), and $4.11 per joint for making 18-in. (45.7-cm.) pipe welds. The tunnel was 2 ft. 6 in. (76.2 cm.) deep and 5 ft. (1.5 m.) wide. The pipe was black steel, 5/16 in. (7.9 mm.) thick, and the ends had 22-deg. bevels to facilitate welding.

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

NECESSITY FOR MATERIALLY INCREASING OFF-PEAK LOAD

Operating Ratio Is Growing, Compelling Central Station Managers to Seek Some Means of Reducing Unit Cost of Production

Cost of rendering service is daily becoming greater and greater, and executives are now faced with what is probably the greatest customer-relation problem ever presented. Certain it is that under the present rates with a load of the present character and with the costs for maintenance, operation and overhead advancing as rapidly as they now are central stations will not be able to lay aside the amounts for various reserves demanded by the state utility commissions and at the same time earn an adequate return on the investment.

A table is here shown giving for 1915 and 1916 the gross operating revenues, operating expenses and operating ratios (ratio of operating expense to operating revenue) for fourteen electric utilities ranging from very large down to medium-sized companies. These are not picked companies but were taken at random and well indicate general conditions.

An analysis of these figures shows that every company received a greater income from operation in 1916 than in 1915, the average for the fourteen being 11.4 per cent. At the same time, owing to the greatly increased price of fuel and to the high cost of labor, the operating expenses of all but the smallest increased in spite of better economies of operation in other directions, the average being 13.3 per cent. True, the net revenue from operation was greater in 1916 than in 1915, but the fact still remains that the relation of the net to the gross operating revenue was less in 1916 than in 1915, in other words that the operating ratio had increased as is shown in the table from an average of 52.2 per cent in 1915 to 53.3 per cent in 1916.

Offhand it would seem that apparently these figures offer no cause for apprehension on the part of utility operators. The net operating revenue is growing, and is that not sufficient? On the bare face of these figures it would of course seem to be so, but behind the scenes, so to speak, there is the matter of investment, depreciation and reserves for contingencies.

Central station investment increased to a considerable extent in 1916—the new load demanded increased generating facilities. This investment, owing to higher prices of materials, was much greater than it would have been in normal times for the same quality and quantity of equipment. To produce the same rate of return on this investment in normal times a much greater net revenue from operation is therefore necessary.

Besides, there must be on this added investment, between now and the time prices come down to the normal basis, a depreciation reserve sufficient to wipe out this loss in value—which is bound to happen—in order to keep the investment always down to the rate-making value of cost to reproduce less natural depreciation. Inasmuch as equipment costs have advanced from 50 to 100 per cent, this additional amount to be deducted from net operating revenue is not insignificant.

A third element is involved, and now that the United States is at war assumes greater proportions, namely, reserves for contingencies. Canadian companies have found these to be very large. Such reserves act, of course, to reduce the amount of net earnings available for dividends.

Nor must it be lost sight of that conditions were much worse during the latter part of 1916 than in the first part. Materials, wages and fuel were considerably higher at the end of the year. In other words, the evil is not abating but is greater than ever before. Had the conditions throughout 1916 been the same as at the end of the year it is extremely doubtful if the net earnings from operation for 1916 would have exceeded those for 1915.

It becomes evident, therefore, that some effort must be made, and that at once, to increase the operating revenue of electric light and power utilities without increasing expenses unduly and without increasing investment charges.

OPERATING RESULTS OF FOURTEEN COMPANIES

	Gross Operating Revenue		Operating Expenses		Operating Ratio, per Cent	
	1916	1915	1916	1915	1916	1915
A	$22,863,000	$20,882,000	$11,908,000	$10,457,000	52.0	50.1
B	16,963,000	14,590,000	8,375,000	6,965,000	49.4	47.8
C	15,160,000	13,472,000	7,731,000	6,798,000	51.0	50.5
D	8,130,000	6,928,000	5,014,000	4,570,000	61.8	66.0
E	8,091,000	7,635,000	5,013,000	4,877,000	62.0	63.9
F	7,201,000	6,952,000	3,604,000	3,411,000	50.1	49.1
G	6,863,000	6,244,000	3,741,000	3,201,000	54.5	51.3
H	4,492,000	3,980,000	2,569,000	2,024,000	57.3	50.9
I	1,810,000	1,770,000	737,000	687,000	40.8	38.9
J	787,000	701,000	507,000	440,000	64.5	62.8
K	714,000	567,000	474,000	362,000	66.5	63.8
L	570,000	499,000	326,000	273,000	57.2	54.8
M	457,000	440,000	270,000	244,000	59.0	56.5
N	425,000	350,000	113,000	117,000	26.6	32.4
Total	$94,526,000	$85,010,000	$50,382,000	$44,426,000	53.3	52.2

Two ways are open—(1) increase rates or (2) make strenuous efforts to increase off-peak load.

To do the first might involve criticism and certainly would mean a commission investigation in those states having commissions with regulatory powers on rates if domestic rates were involved. In the end this might prove very costly in legal fees and in engineering investigation fees. Power rates, on the other hand, are so low that it would probably not be difficult to increase them to keep step with the increasing cost of fuel and labor. In fact, some companies are now making power contracts with provisions that rates shall bear a direct relation to the cost of fuel.

The second method, on the other hand, arouses no animosity, keeps employees hired, and builds up a better and more stable business not only for the present but for the future, first, by increasing the diversity factor and,

second, by leveling out the load curve and thereby cutting down the overhead cost per kilowatt-hour generated.

To let go or cut down a productive sales staff at a time when it can be most useful in building for all time, besides strengthening the resources of the present, is, of course, a dubious policy and hardly in harmony with the great economic principle that business must go on.

The one question, therefore, that remains is, can the central station sales department develop an off-peak load to keep down the cost of energy? This, of course, must be answered by each company individually. There still remains the thought, however, that no city has reached its saturation point for electrical installations. Domestic consumption along the lines of appliances will probably be the most effective method to pursue. This for the reason that the consumption is large and the energy rate high. Next in line are the store appliances involving the use of fractional horsepower motors, and next are probably the small industrial heating appliances for the mechanic. There are many other varied opportunities, but it all simmers down to the one thing—a drive to increase the appliance load.

This is almost entirely an off-peak load, and the only added operating expense that would amount to much would be fuel. The sales expense in a well-directed utility would come out of the profits on appliances.

As a result there would be, (1) increased earnings from appliance profits, (2) increased earnings from operation, (3) a better load curve that would be of value in the future as well as the present, and (4) a reduced cost per kilowatt-hour generated.

POLICY OF LARGE-SCALE APPLIANCE PURCHASING

Successful Experience of One Central Station That Is Buying at Wholesale for Resale at List

In view of the greatly enhanced prices of to-day, central station managers, it is known, are hesitating to lay in large stocks of appliances. Two of the reasons most frequently advanced are that prices may decline, resulting in a loss, and that customers will not pay the price.

Under the present conditions of material shortage, factory congestion and labor shortage it is extremely doubtful if any recession in prices will occur for a long time. As regards the customers' willingness to pay the price the doubt is largely the child of the central station managers' fancy.

Of course the central station manager knows to what extent appliances have advanced—practically doubled in price in many cases—but there is absolutely no good reason for believing that customers realize this. In fact, it is much more reasonable to believe that customers know almost nothing about what electric appliances should cost. To refrain at the present time, when the off-peak load is of greater economic value than ever before, from pushing appliances, on the assumption that customers feel that prices are too high, is, to say the least, a highly inexpedient policy to pursue.

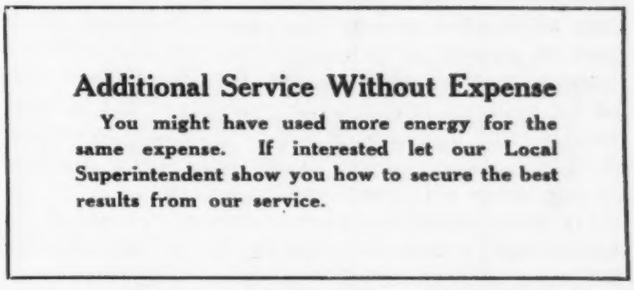
The experience of a central station in what is probably the most conservative section of the United States in buying on a large scale for resale purposes is extremely interesting and should prove of value to central station managers who are undecided on this matter.

The sales manager of this company took a flyer in electric lighting fixtures a few months ago, while on a visit to New York, to the extent of some $10,000, and without asking for an "O. K." from home. When the bills began to appear on the chief executive's desk some question arose as to the wisdom of the purchase, but the sales manager secured a "stay" of sentence. Within six months all the fixtures were sold and the consumers were "hollering for more" in the face of a two-dollar advance for the fixtures at the factory on supplementary orders. The sales manager's judgment was vindicated, and he followed up his advantage by buying 1000 vacuum cleaners and a carload of electric signs, all of which will go to the consumer at list price. Large-scale buying is the business policy of this company when price and market conditions can be correctly "sensed."

SERVICE TO "LESS-THAN-MINIMUM" CONSUMER

Southern California Company Makes Improvement on Former Method for Bringing Monthly Consumption Up to Par

An improvement to the method of calling a customer's attention to the fact that he is using less energy than the minimum bill allows, described on page 516 of the ELECTRICAL WORLD for March 17 last, has been made by the Southern Sierras Power Company. It is a simple sticker in red ink, a reproduction of which is shown herewith.


Additional Service Without Expense
You might have used more energy for the same expense. If interested let our Local Superintendent show you how to secure the best results from our service.

STICKER NOTIFYING CUSTOMER THAT LESS ENERGY THAN IS ALLOWED UNDER MINIMUM BILL WAS USED

INTENSIVE SOLICITATION OF HOUSE-WIRING CONTRACTS

Tendency Noticed to Spend More Time in Signing Up Customers in Effort to Secure Orders for More Outlets

For some years central station business has been developed extensively, the principal idea being to install service. Of late, it has been noticed, there has been accumulating gradually a well-defined feeling that more pains should be taken with individual installations, that campaigning should be more intensive.

It is not enough that a customer have the regulation outlets. Efforts are now being made by many progressive central stations to induce the house owner to have additional outlets for dining-room appliance service, for floor lamps, for vacuum cleaners, washing machines and other appliances. Even though the customer has no appliances and even though he has no im-

mediate desire to purchase any, the fact that the outlets are there will simplify the purchase of these appliances once they are desired.

Among those central stations that are leaning toward this idea of more intensive work in contracting for house wiring is the Public Service Company of Northern Illinois. Speaking before the commercial men of the Illinois State Electric Association, Fred H. Scheel of Joliet said: "I think that two or three years from now a campaign for added outlets will be just as popular as a campaign for old-residence wiring is at the present time. In analyzing ways and means of promoting this work we find that the field naturally divides itself into three distinct units:

"First, the proposed house or the new house under process of construction; second, the house already wired but not provided with appliance outlets; third, the house not yet wired.

"Our method of getting business from the first of these fields is through an educational campaign. In the second field we solicit additional outlets on the same basis on which we now solicit old-house-wiring business. For getting business in the third field a plan has been adopted for making appliance outlets an important part of every job taken either by us or by the contractor. Our slogan throughout the campaign is 'More sockets for more service!'

"In the house not yet wired commissions are paid as follows: The salesman receives a commission on any contract for wiring completed residences or flat buildings which are signed by him. Commission will not be paid on a re-wiring job. The salesman is paid a commission on each contract secured for wiring a completed or flat building, provided the residence or flat building requires only a secondary service wire drop to connect it to the company's lines. These commissions are paid in accordance with the following schedule:

"A. A commission of 50 cents where the contract for wiring only, exclusive of fixtures, is $15 or less than $20.

"B. A commission of 75 cents where the contract for wiring only, exclusive of fixtures, is $20 or less than $30.

"C. A commission of $1.25 where the contract price for the wiring only, exclusive of fixtures, is $30 or less than $60.

"D. A commission of $1.50 where the contract price for wiring only, exclusive of fixtures, is $60 or more.

"Additional commissions are paid as follows:

"A. A commission of 40 cents for the installation of wiring from the floor underneath the dining-room table to a point under the leaves of the table, at which point there shall be installed a receptacle for attaching electrical appliances.

"B. A commission of 20 cents for each baseboard or floor receptacle installed and wired for in dining room, kitchen or basement where usual outlets for lighting are also installed.

"C. A commission of 10 cents for each baseboard or floor receptacle installed at any other location in the house where usual outlets for lighting are also installed."

Contracts are not taken on the company's twenty-four-payment plan where the contract price including wire and fixtures amounts to less than $24. The salesman, in addition to receiving his commissions on contracts signed by himself, receives, at the discretion of the general superintendent, one-half of the commissions on contracts signed by the contractor. It is thought that this plan of paying commissions greatly accelerates the sale of extra outlets.

OPERATING EXPENSES OF ELECTRIC DELIVERY TRUCK

Daily Cost for 2-Ton Truck, $6.92; for 3½-Ton Truck, $7.92, and for 5-Ton Truck, $8.87, in Ice-Cream Delivery Service

At a recent convention of the National Association of Ice Cream Manufacturers, A. L. Parkhurst gave some figures showing what it costs to use electric trucks for ice-cream delivery. The figures shown herewith are for 2-ton, 3½-ton and 5-ton trucks:

	2-Ton Truck	3½-Ton Truck	5-Ton Truck
Repairs and painting	$140.00	$165.00	$180.00
Battery repair and renewal	312.75	347.00	428.88
Tire repair and renewal	212.90	344.61	439.80
Miscellaneous, grease, water, etc.	40.00	50.00	50.00
Garage, at $15 per month	180.00	180.00	180.00
Driver, at $15 per week	780.00	780.00	780.00
Electric energy, at 4 cents per kw.-hr.	316.00	362.00	446.00
Depreciation of chassis, at 10 per cent	185.30	225.00	253.72
Depreciation of body, at 20 per cent	60.00	95.00	100.00
Interest, at 3 per cent	99.00	123.75	143.25
Liability insurance	100.00	100.00	100.00
Fire insurance, at 1 per cent	33.00	41.25	47.75
Total cost, per year	$2,458.95	$2,813.61	$3,149.40
Total cost, per day	$6.92	$7.92	$8.87

FLOODLIGHTING AN ART MUSEUM WINDOW

Five-Hundred Watt Unit Used to Bring Out Full Beauty of Costly Window at Worcester, Mass. Designed by Lafarge

An unusual application of floodlighting was recently made at the Worcester (Mass.) Art Museum by the Worcester Electric Light Company. At the rear of the building is a stained-glass window, 20 in. by 40 in. (50.8 cm. by 101.6 cm.) in dimensions, designed by John Lafarge of New York. The figure is that of a peacock in full high colors, the deepest and darkest of colors being on the neck and head. The window is composed of three layers of heavy glass. The first layer consists of eight pieces leaded together, the second layer is composed of a larger number of pieces fused together, and the third layer consists of a very heavy piece of ground glass binding the three layers together.

To see the window in its full beauty it was necessary to have a bright, sunny day; on dark days and at night it was obscure. To overcome this difficulty, a 500-watt gas-filled lamp with a floodlight projector was mounted on the outside of the building about 15 ft. (4.6 m.) from the wall and placed in such a way as to throw the direct rays on the window. The lamp was supplied by a circuit of No. 14 wire run from a panelboard in the basement. The cost of the installation was about $100. The problem of properly lighting this window had been several times considered by electrical interests in Worcester, but until the application of floodlighting was made it had not been solved. The window is said to be the most expensive one for its size in the United States, having cost about $7,000.

ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

SWITCHBOARD MEANT FOR ELECTRIC-FURNACE WORK

A Description of an Inexpensive Switchboard Giving Great Flexibility in the Operation of Small Electric Furnaces

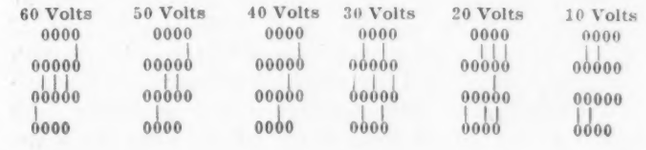
AT THE meeting of the American Electrochemical Society held in Detroit from May 2 to 5 a paper was presented describing a rather simple switchboard for experimental electric-furnace work, the author being W. L. Badger of the University of Michigan.

The transformer is rated at 10 kva. and is built for 230 volts on the high-tension side. The high-tension winding has five taps, so that low-tension voltages of 10 per cent above nominal, 5 per cent above nominal, 5 per cent below and 10 per cent below may be obtained. On the low-tension side are two 10-volt coils and two 20-volt coils.

A diagrammatic sketch of the wiring is shown in Fig. 1. The supply line is connected to a double-pole circuit-breaker at the top of the board. This is provided with both overload and shunt-release coils. From the breaker the current passes to the double-pole double-throw switch *I*, which connects the 220 volts either to the busbars direct or to the high-tension side of the transformer through the three single-pole, double-throw switches *E*, *F*, and *G*. The five taps of the high-tension winding are connected to these as shown by the numerals. The connections are as follows:

Switches			Voltages Generated in Low-Tension Coils
E	F	G	
Down	Down	Down	10 per cent above nominal
Down	Up	Down	5 per cent above nominal
Up	....	Down	Nominal
Down	Up	Up	5 per cent below nominal
Up	....	Up	10 per cent below nominal

The connections of the low-tension coils are made by means of the four rows of knife-blade fuse clips shown at the right side of the board. The four upper clips are connected by a busbar, as are also the four lower ones. The low-tension coils are connected diagonally across the two middle rows as indicated. The extreme left clip of the second row and the extreme right clip of the third row are to form a bridge in making the 30-volt connection. Connections are made by short copper bars with suitable handles, which can be plugged into any pair of clips in a vertical line. By this means any combination of series, parallel or series-parallel connections can be made, giving low-tension voltages of 60, 50, 40, 30, 20 or 10 volts at ratings of 100, 83, 67, 100, 100 and 33 per cent respectively. The connections are shown below:



With any one of these arrangements the voltage may be varied through five smaller steps by means of the switches *E*, *F* and *G*, as shown above. The result is a very flexible arrangement, particularly suitable for granular carbon resistance furnaces where there is a wide range of resistance as temperature changes. The

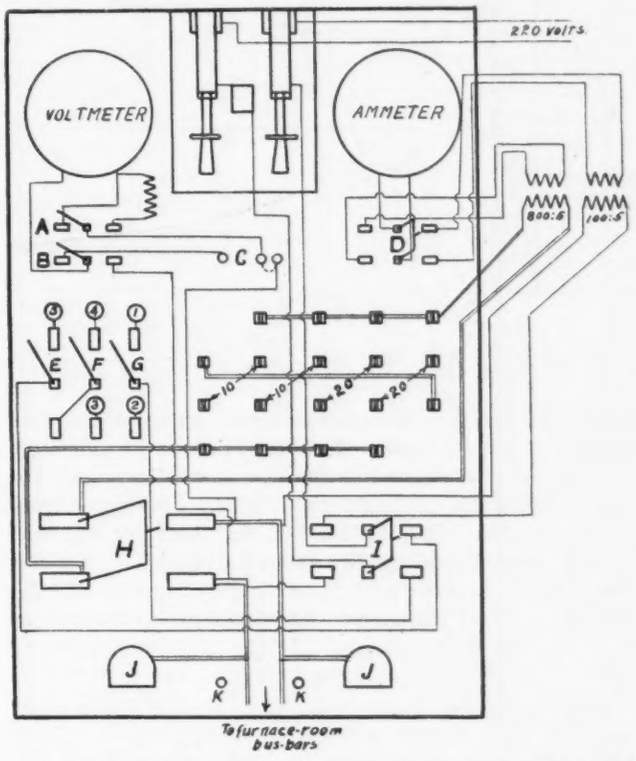


FIG. 1—WIRING OF SIMPLE SWITCHBOARD FOR EXPERIMENTAL ELECTRIC-FURNACE WORK

actual voltages delivered when no current is being used are as follows:

64.5	53.5	43.0	32.5	21.5	12.0
61.5	51.0	41.0	31.0	20.5	11.5
59.0	49.0	39.0	30.0	20.0	11.0
56.0	46.5	37.0	28.5	19.0	10.5
53.5	44.5	35.5	27.5	18.0	10.0

From the low-tension connections the current passes through the ammeter transformer and then to the furnace-room busbars. A pair of terminals *J* is added so that current may be taken directly from the board. The voltmeter is so connected that it can be used to read the voltage on the busbars or the voltage across the binding posts *C*. By this latter arrangement it is possible to take the voltage drop across any part of the furnace. At the bottom of the board is a pair of binding posts *K* to which the shunt coil of the circuit breaker is attached. By means of a 220-volt push button the breakers may thus be tripped by the person working at the furnace.

Since the busbars may carry both 220 volts and the low-voltage current, both ammeter and voltmeter have

double scales. The voltmeter reads 0 to 75 or 0 to 350 volts, the change being made by the switch *A*. The low-tension circuit includes an 800 to 5 transformer, and the high-tension circuit a 100 to 5 transformer. Some suggestions of possible improvements are added.

Generators, Motors and Transformers

Torque and Slip of the Induction Motor.—M. KLOSS.—Neglecting in Fig. 2 the stator resistance, it is shown that $M/M_m = 2/S(S/S_m + S_m/S)$, where M = torque at

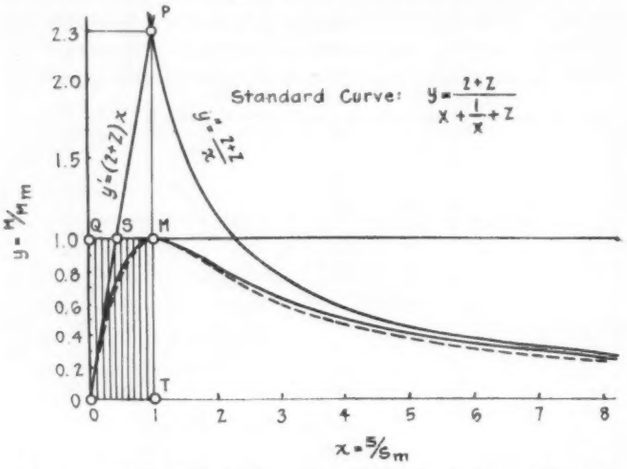


FIG. 2—CURVE GIVING RELATION BETWEEN TORQUE AND SLIP

slip S, and M_m and S_m are the torque and slip when the torque is a maximum. This equation is of the form $y = 2/(x + 1/x)$, and is the same for all motors; the curve can be drawn once for all. If the starting moment be M_1, then $M_1/M_m = 2/(S_m + 1/S_m)$, and this equation can be represented by the same curve if the abscissæ are taken to represent $1/S_m$ and the ordinates M_1/M_m. With the aid of this curve the relations between torque and slip can be immediately determined for any motor for which M_m and S_m are known. The geometrical properties of the curve are very fully discussed. The value of S_m is shown to be $R_2 I_{2d}/E_{2\cdot0}$, where $E_{2\cdot0}$ = rotor emf. per phase with circuits open and machine stationary, R_2 = resistance per phase of rotor winding, I_{2d} = ideal short-circuit current in rotor winding (corresponding to the diameter of the current circle). In order to obtain the maximum torque at starting, $S_m = 1$, and $R_2 = E_{2\cdot0}/I_{2d}$. The relation between normal full-load torque M_n and the maximum torque is determined from the point of view of overload capacity; suppose the required overload capacity be p, and that an allowance of 15 per cent be made for safety, $M_n = 0.85M_m/p$, and it follows that $M_1/M_m = 2.35p/(S_m + 1/S_m)$. The ratio between the starting torque and full-load torque can thus be found from the value of S_m for any given value of the overload capacity p. A series of curves connecting these quantities is given in the original. The influence of the resistance of the stator windings is next considered; it is shown that the formula $S_m = R_2 I_{2d}/E_{2\cdot0}$ is applicable to this case as well as to the previous one, and that $M/M_m = (2 + z)/(S/S_m + S_m/S + z)$, where $z = 2I_{1d}r_1/E_1$, I_{1d} being the diameter of the current circle measured to the scale of the primary current, r_1 the resistance of the stator winding per phase, and E_1 the applied emf. per phase. For motors with a pole pitch of about 10 cm. or 15 cm. the value of z is about 0.30; for those with a pole pitch of 20 cm., $z = 0.15$. For smaller values of z the curve connecting M/M_m with S/S_m is indistinguishable from that obtained by neglecting the stator resistance, and when the latter is employed in determining the starting torque the error is on the side of safety. In the illustration the full-line curve passing through M is drawn for $z = 0.30$, while the dotted curve applies for $z = 0$; *i.e.*, for no stator resistance. The maximum torque is given by $M_m = 0.973P_m/n$ in kg. m., where n_1 = synchronous speed of motor in r.p.m. and $P_m = 3E_1 I_{1d}/(2 + z)$.—From *Archiv. f. Elektrot.*, Vol. V, page 59, 1916, abstracted in *Science Abstracts*, Section B, Feb. 26, 1917.

Lamps and Lighting

Arcs Under Pressure.—W. MATHIESEN.—Investigations carried out by O. Lummer on the melting of carbon and the production of the temperature of the sun showed that the brilliance of the positive crater of an arc increases with the pressure of the surrounding air. This has led to the expectation that arc lamps might be improved by the use of compressed air. The present tests were made in the laboratories of Körting and Mathiesen with the object of developing an improved commercial lamp, with the result that the conclusion has been drawn that the use of compressed air shows no promise of being usefully applicable to arc lamps in the present state of technical knowledge. The tests were made at a constant current of 10 amp. with various types of carbons of diameter 10 mm. for the positive and 9 mm. for the negative. In one series of experiments the arc had inclined carbons, with the positive horizontal, that could be viewed from two different directions through openings in the containing vessel. These openings were used for photometric measurements and also to project images of the arc on a screen, so as to study the length and form of the arc and the shape of the carbon tips. A large number of pictures of the arc under varying conditions are reproduced in the article. The air pressure was varied from 3.4 atmospheres vacuum to 5 atmospheres compression. It was found that the arc becomes unstable and shrinks in dimensions at the higher air pressures and that its length is shortened at constant voltage. If the arc is

AIR-PRESSURE TESTS WITH VARIOUS TYPES OF CARBON

	Atmospheres		CP. AT 45 DEG. TO AXIS OF POSITIVE CARBON					
			0	1	2	3	4	5
Noris cored (pos.).....	Inclined	Volts	68–70	68–70	73	72–75	75	75–80
Noris solid (neg.).....	carbons	Cp.	2170	2600	2930	3200	3100	2820
10 mm. and 9 mm.....	10 amp.	Watts/Cp.	0.318	0.265	0.250	0.230	0.242	0.274
Excello 104 (pos.).....	Inclined	Volts	35	40	45	50	55	60
Noris solid (neg.).....	carbons	Cp.	1400	2100	2720	3420	4300	4600
10 mm. and 9 mm.....	10 amp.	Watts/Cp.	0.26	0.19	0.166	0.146	0.128	0.130
			MEAN HEMISPHERICAL CP.					
Noris solid (pos.).....	Vertical	Watt	698	692	692	710	710	720
Solid with graphite	carbons	Cp.						
(neg.).....			960	1000	1000	1040	975	760
12 mm. and 10 mm.....	11 amp.	Watts/Cp.	0.725	0.692	0.692	0.680	0.728	0.945
	65 volts							

to be maintained of approximately constant length, increased voltage has to be applied with increased air pressure. When Excello cored carbons (fluoride of calcium) were used as positives it was found that with inclined carbons and increased air pressure the positive carbon tended to form a wedge-shaped projection over the negative carbon so as to cut off the light given out

by the crater. This could be removed by increasing the arc voltage. On one series given the voltage was increased from 30 volts at 0 atmosphere to 60 volts at 5 atmospheres with the arc length approximately constant. Regarding the instability of the arc it appears that while it is possible to work up to 5 atmospheres with vertical carbons, the arc becomes too erratic for useful purposes at 1 atmosphere when the carbons are inclined. The consumption of carbon increases with the air pressure, being nearly doubled when the pressure is raised from 0 atmosphere to 5 atmospheres. Photometric tests are given for many series of tests with various types of carbons. Those shown in the table are typical.—*Elek. Zeit.*, Oct. 12 and 19, 1916; abstracted in *Science Abstracts*, Section B, Feb. 26, 1917.

Traction

Inductive Field Shunts for Railway Motors.—L. ADLER.—In the early days of electric traction the weakening of the field of motors was recognized as a method of reducing the current consumption and heating of the motors. The use of this principle was abandoned owing to the fact that flashing-over resulted. Its adoption was again tried with the advent of motors with commutating poles, but although the motors were well able to carry the full steady load, flashing-over and severe sparking at the brushes occurred if the armature current was momentarily interrupted, as is common when the current is taken through a sliding contact. This was due to the fact that the series fields of the motors were shunted by non-inductive resistances, which caused abnormal current rushes to occur on account of the magnetic inertia of the polar windings. Improvement was effected by strengthening the springs of the sliding contacts and increasing the number of contacts. It was found that the trouble was marked if the time of interruption of the current exceeded one-third second and that flashing over took place with 50 per cent weakening of the field if the interruption was of the order of one to one and one-half seconds. If the field of the motors was reduced by shunting to 85 to 90 per cent of its full value, no trouble was experienced at the brushes due to the shunting. One method of preventing the above ill effects is to install relays that cut off the shunts when the armature current is broken, so that when the circuit is re-established the motors have their full fields. This method is efficient on current interruption, but does not give the required result when short circuits occur in the network. It involves the use of somewhat delicate apparatus on the vehicle. A second method that is applicable is to weaken the fields of the motors by subdividing their field windings and bringing out tappings. The method that is now advocated is the provision of inductive shunts instead of non-inductive shunts. The self-induction of the shunts should be somewhat greater than that of the field coils to which they are connected in parallel. If the field current is to be reduced to less than 60 per cent of its full value, the shunting should be effected in two steps to avoid serious rushes of current in the armature. In this case the first step, which is not used for steady running, connects across the field a shunt containing a non-inductive resistance in series with an inductive resistance, and the second step is obtained from the first by short-circuiting the non-inductive resistance. Illustrations are given of shunts of this type built by a German company and used with success on a large number of railways.—From *Elek. Zeit.*, Nov. 30, 1916; abstracted in *Science Abstracts*, Section B, March 31, 1917.

Installations, Systems and Appliances

Heating of Plant and Transmission Lines by Short Circuits.—L. BINDER.—In large generating stations and distributing networks it is customary to adjust the circuit breakers so that on a short circuit the current is not interrupted until after one to ten seconds. On this account the fear has been expressed that the plant and line may be exposed to excessive heating or mechanical strains. As oscillograms have shown that the maximum forces come into play with extreme suddenness, it is not possible to protect the apparatus by circuit breakers against strains arising from this cause. In the present article the heating effects are calculated, and it is shown that in general no overheating of the generators, transformers and line will take place even in the extreme case of the circuit being interrupted after as long as ten seconds. The coils of current transformers and circuit breakers are endangered most, and it is recommended that for these parts the ratio of the greatest possible effective short-circuit current to the rated current should be not greater than $65/\sqrt{t}$ for these parts, which t seconds is the duration of the short circuit. The ratio of the effective short-circuit current to the permanent value of the short-circuit current may be taken as averaging 1.3 for short circuits of ten seconds' duration, and this would give a value $50/\sqrt{t}$ for the above ratio in terms of the permanent short-circuit current. The calculations are extended to the case of electrical apparatus and lines made of "substitute" metals such as aluminum, zinc and iron, and it is found that notwithstanding the higher resistivity of these metals compared to that of copper, the heating effects are generally smaller.—From *Elek. Zeit.*, Nov. 2 and 9, 1916; abstracted in *Science Abstracts*, Section B, Feb. 26, 1917.

Wires, Wiring and Conduits

Insulating Material.—A note on a German-made insulating material, called "galalith," which resembles horn and celluloid and consists essentially of casein and formaldehyde. Galalith is prepared by heating skimmed milk with caustic alkali; from the clarified solution the casein is precipitated by means of acid and filtered. The water is removed by compression and by drying; the latter process has to be very slow and takes several weeks. The resulting dry casein plates are saturated with formaldehyde and dried again. The final product is of a yellow-white color and translucent and makes an excellent insulator, which may be shaped cold after having been softened by the aid of hot water. It has no odor and is less inflammable than celluloid, but it is not quite transparent and cannot be prepared in the thin films in which celluloid is utilized. The specific gravity is about 1.32, and the hardness 2.5 on the Mohr scale. —London *Electrician*, April 6, 1917.

Miscellaneous

Depreciation of Plant.—F. GILL and W. W. COOK.—Their full paper read before the (British) Institution of Electrical Engineers on principles involved in computing the depreciation of plant. A full account is also given of the discussion which followed the presentation of the paper in London as well as in other local sections.—*Journal Inst. of Elec. Engineers*, February, 1917.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

CONTROL OF OMAHA COMPANY PASSES TO NEW INTERESTS

American Power & Light Company and Local Omaha Capitalists Acquire All of the Outstanding Common Stock

The American Power & Light Company and local interests at Omaha, Neb., have acquired all of the common stock of the Omaha Electric Light & Power Company.

Combined gross earnings of the Omaha Electric Light & Power Company and its subsidiary for the twelve months ended March 31, 1917, were $1,851,161. Operating expenses were $1,100,245, and net earnings $750,916.

PROGRESS ON LOS ANGELES AQUEDUCT POWER SYSTEM

Total of 37,500 Hp. Available for City Distribution, Contracts Being Signed for New Business, and Substations Under Way

Pending final completion of the plan for purchasing distributing systems of the Southern California Edison Company and the Pacific Light & Power Corporation, as outlined in the ELECTRICAL WORLD of April 28, the city of Los Angeles is finishing the construction of its system for generating and distributing energy.

On April 10 current was delivered at the central substation at Holly and St. John Streets, Los Angeles, over the 100,000-volt line from the generating plant in San Francisquito Canyon. This plant, which is connected with the city by 44 miles of transmission line, is now fully equipped and able to deliver the full rating of 37,500 hp. as soon as there is demand for this quantity. Final work on the transmission line has been rushed during the last few months, a great portion of it having been done between Jan. 15 and March 15.

In addition to the central receiving substation, three distributing substations within the city limits are under way or contemplated. The Garvanza substation, in the northern part of the city, is now operating, being fed by two duplicate 33,000-volt lines from the central receiving substation. The total transformer capacity at this plant is 1800 kw., the secondary system fed from this point being 2200 volts, three-phase, three-wire.

A substation at Slauson Avenue and Figueroa Street, to have an ultimate capacity of 3600 kw., stepping down from 33,000 volts to 2200 volts, is under construction. This is expected to be ready about July 1, to supply the 12,000 consumers in the district, one-half of whom have signed up for municipal service. This district is now served exclusively by the Los Angeles Gas & Electric Corporation, which is not considering the transfer of its rights to the city. The city is therefore planning to parallel the distribution system of that company in this district. The 900 street lights that would logically be served from a station at this point are being supplied by the Los Angeles Gas & Electric Corporation on a contract which can be terminated on thirty days' notice, and this business will of course be assumed by the city as soon as the substation is ready for service. About 700 new lights will then be installed.

The distributing lines of the municipal system have been laid out with the idea of placing other substations in the San Pedro and Wilmington district and in Hollywood, these points being centers of consumption within the city limits. The lines have been built to these two points, but construction on the substations is not yet under way.

As the ELECTRICAL WORLD goes to press the city and representatives of the power companies have agreed on terms of a contract for purchase of the two distribution systems and have executed a working agreement which provides for distribution of the city's power over the companies' lines for two months or pending the results of a bond election to be held on June 5, when the people will be asked to authorize $12,000,000 bonds for consummating the purchase plans and for further power development.

This working agreement became effective May 1. The city, however, will continue to maintain its own forces to manage the business, which will be increased materially by entry of the Los Angeles Gas & Electric Corporation. Under the two contracts the lines of the two companies which it is proposed to purchase are not to be paralleled.

LOS ANGELES MUNICIPAL SYSTEM APPLICATION FILED WITH COMMISSION

The city of Los Angeles, the Southern California Edison Company and the Pacific Light & Power Corporation have filed with the California Railroad Commission a joint application for determination by the commission of its jurisdiction over an agreement for the sale of electrical energy by the city to these companies, an approval of this agreement if the commission holds that it has such jurisdiction, and pending this determination an order by the commission authorizing the petitioners to carry out the contract made by the three parties.

The agreement that the city and electric companies want approved is the result of long negotiations for the purchase of distribution systems in Los Angeles of the two companies by the city and for a temporary operating agreement. The temporary contract will permit the issue and sale of the city's electric energy until after the election of June 5, when, if the systems are bought, the city will distribute its own electricity. The details of the temporary agreement were announced in the ELECTRICAL WORLD for April 28, page 816.

If the twelve-million-dollar power-bond issue is not carried the city may extend the contract beyond July 1 upon ten days' notice to the companies, and will have the right to cancel the extension of the contract, which calls for two years' operation, upon three months' notice. The right to cancel the contract is available to the city

upon the initiative or by two-thirds vote of the City Council of Los Angeles, after the Public Service Commission of Los Angeles has voted to do so. The fact is that the companies have already connected their distributing systems with the Los Angeles power lines in anticipation of approval by the Railroad Commission following the signing of the contract by the companies and the city.

STRONG POLICE POWER OF FLOODLIGHTING

Value of Electric Illumination as Protection for Coal Piles and Other Property of Central Station Companies

In the comparatively short space of time since war was declared against the German government much has been done in all parts of the country to protect plants by the use of floodlighting at night. Fortunately the commercial progress and technical development of floodlighting enabled its instant utilization in this necessary safeguard.

Central station companies operating by steam power and hydroelectric properties turned promptly to flood lamps as providing a valuable supplement to their policing plans. Industrial establishments of every character are installing flood lamps in large quantities. Whether they employ large or small forces of employees, manufacturing companies have learned that such illumination is a powerful moral deterrent against possible disorder or sabotage.

Thus the old lesson of "the police power of light" is being put to new use to guard plants. It does not require much argument to convince the owner of a factory that, aside from the moral suasion wielded by strong light, there is economy in the use of a medium which reduces the number of men for guarding a plant after dark and at the same time makes their work more thorough and the results surer.

OUTDOOR SUBSTATION FLOODLIGHTED

One of the greatest advantages of floodlight can be obtained by its use on the coal piles of a central station company. Depleted though such piles have been by the abnormal coal situation, they represent greater value per ton, as coal remains high and the companies are making every effort to build up adequate reserves.

PROTECTING COAL-CONVEYING SYSTEM AND STORAGE YARDS OF CENTRAL STATION BY LIGHTING AT NIGHT

FLOODLIGHTING PROTECTS A PLANT ON RIVER FRONT

"Somewhere in New England" Flood Lamps Are Used to Light the Entire River Wall and the Adjacent Waters

An important steam-turbine plant supplying a large number of power and lighting customers and also an electric railway "somewhere in New England" is protected at various points by well-placed flood lamps. Several are mounted on brackets on the side of the station building bordering a river navigable to small craft. The management decided to take no chances on the approach of hostile parties by water, and the lamps flood the entire river wall of the station and the adjacent waters most satisfactorily. A 500-watt unit is employed in the case illustrated. It throws a spreading sheaf of light rays along the wall in the form of a luminous curtain parallel with the brickwork.

METHOD OF FLOODLIGHTING A NEW ENGLAND RIVER-BANK PLANT

BUSINESS OF UNITED GAS IMPROVEMENT COMPANY

More Electrical Properties Acquired—Electrical Energy Sales Gain 20.61 Per Cent—Analysis of Assets and Liabilities

Samuel T. Bodine, president United Gas Improvement Company, says in the annual report to shareholders for 1916 that the company has arranged recently to purchase certain electric power properties in order to increase its business.

In the properties outside of Philadelphia in which the company is interested sales of manufactured gas increased, in comparison with 1915, 5.83 per cent, of electrical energy 20.61 per cent, and of natural gas 13.83 per cent. Net profits were $7,269,331, or 13.1 per cent on the stock or 8 per cent upon "the capital actually employed and invested in the business, which includes the undivided profits."

The directors are of the opinion that the company is now established on such a firm foundation that, when annual earnings and general business conditions permit, it is safe to adopt the policy of distributing in extra dividends a larger proportion of the earnings than heretofore.

As the company books and reports state assets at cost price, frequent inquiries are made as to whether this represents actual value. Therefore an analysis of assets and liabilities, as a going concern as of Dec. 31, 1916, has been made by officers of the company. The president and directors feel that a fair liquidating value of the stock should be not less than $100 per share.

CLEVELAND COMPANY RAISES POWER RATES 20 PER CENT

Result of Increased Cost of Coal and Other Materials —Earnings of Holding Company Show the Reasons Clearly

Beginning May 1, the Cleveland Electric Illuminating Company made an increase of 20 per cent in its schedule for large consumers who have very low rates. The necessity for this lies in the increased cost of coal and other materials. The new rates have been approved by the Ohio Public Utilities Commission. Light rates remain unchanged.

The reason for this action is apparent in the following statement of the Central States Electric Corporation, which controls the Cleveland Electric Illuminating Company:

EARNINGS AND EXPENSES OF HOLDING COMPANY

For month of March:	1917	1916	Increase
Gross earnings	*$548,145	*$442,108	$106,037
Expenses and taxes	†443,951	233,042	210,909
Net income	$104,193	$209,066	‡$104,873
Interest charges, etc.	49,216	36,634	12,582
	$54,977	$172,431	‡$117,454
Depreciation	54,815	44,211	10,604
Applicable to common dividends	$162	$128,220	‡$128,058
Three months ended March 31:			
Gross earnings	*$1,715,801	*$1,348,017	$367,783
Expenses and taxes	1,322,433	669,807	652,626
Net income	$393,367	$678,209	‡$284,842
Interest charges, etc.	141,114	109,604	31,510
	$252,252	$568,605	‡$316,352
Depreciation	171,624	134,802	36,821
Applicable to common dividends	$80,628	$433,802	‡$353,174
Twelve months ended March 31:			
Gross earnings	$5,477,521	$4,535,591	$941,029
Expenses and taxes	3,635,679	2,418,419	1,217,259
Net income	$1,841,841	$2,117,171	‡$275,329
Interest charges, etc.	495,612	428,510	67,102
	$1,346,229	$1,638,661	‡$342,431
Depreciation	547,795	553,559	‡5,754
Applicable to common dividends	$798,434	$1,135,102	‡$336,857

*Earnings subsequent to April 25, 1914, are subject to adjustment after decision in pending rate proceeding.
†The extra cost of coal in March due to higher prices per ton is included, and amounts to $168,000.
‡Decrease.

The Cleveland Illuminating Company has so far oversold its plant capacity that all new-business endeavor has been abandoned, thirty-two men on the commercial force having been discharged. Those desiring service are compelled to apply to the company's office in person, and where the service requires an extension it is granted only upon the payment by the customer of all costs. Power contracts of 400, 1000 and 3000 kw. have been summarily rejected or indefinitely postponed because of the company's inability to handle the business.

WAR TAX FOR ELECTRICITY USED FOR DOMESTIC PURPOSES

Committee on Ways and Means of House of Representatives Proposes Levy—Bill Goes to Senate Committee

The committee on ways and means of the House of Representatives, in its proposed war tax bill, includes a section which, if enacted into law, will bear heavily upon electric central station service for domestic uses. Electric and telephone service under the bill would be taxed as follows:

"A tax equivalent to 5 per cent of the amount paid for electric power for domestic uses and of the amount paid for light or heat, and a tax equivalent to 5 per cent of the amount paid for telephone service by subscribers, exclusive of the amounts paid for toll or long-distance calls;

"Provided that any expense incurred by any person, corporation, partnership or association in furnishing such services or facilities for its own use shall not be subject to this tax."

No hearings were held by the House committee. The bill now goes to the finance committee of the Senate, which will hold open hearings.

"BETTER BUSINESS" AS SLOGAN OF ASSOCIATED MANUFACTURERS

President Sheppard Calls for United Action Along the Lines of Howard E. Coffin's Practically Patriotic Appeal

R. K. Sheppard, president of the Associated Manufacturers of Electrical Supplies, has issued the following letter, addressed to the members of the association:

BETTER BUSINESS—CALMNESS VERSUS HYSTERIA IN OUR MANUFACTURING COMMUNITIES

The article which Mr. Howard E. Coffin, a member of the Advisory Commission of the Council of National Defense, allowed to be published over his signature on April 19 last is so very timely and pertinent that I am sending to you this special request concerning it.

I believe that all manufacturers in our association ought to consider carefully and heed Mr. Coffin's admonitions. That none of our members may overlook his admirable article I am sending to you with this letter a copy of it. Even though you may have already seen it, I ask you to read it again.

In furtherance of practical patriotism, so necessary at this time, will you please pass on to your colleagues and to your business friends the excellent slogan:

"BETTER BUSINESS,"

which has been suggested by Mr. Robert McKean Thomas, president of the Thomas & Betts Company, New York City, for our association watchword?

SECTION AND GOVERNORS' MEETINGS

At the meeting of the wire and cable section of the Associated Manufacturers of Electrical Supplies held on April 17 at the Yale Club, New York City, the following officers were re-elected for this year: LeRoy Clark, chairman, Safety Insulated Wire & Cable Company, New York; J. Nelson Shreve, secretary, Electric Cable Company, Bridgeport, Conn.; Edward F. Sawyer, treasurer, Atlantic Insulated Wire & Cable Company, New York.

The board of governors of the Associated Manufacturers will meet on Wednesday, May 16, at the new offices of the association, 30 East Forty-second Street, New York City.

The line material section of the Associated Manufacturers met on May 4 at the association offices, New York City. The following officers were elected for the ensuing year: W. R. Williams, chairman, General Electric Company, Schenectady, N. Y.; H. L. Garbutt, secretary, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.; R. C. Buell, treasurer, Johns-Pratt Company, Hartford, Conn.

The rigid conduit committee of the interior conduit section met on April 30, at the William Penn Hotel, Pittsburgh, Pa. The next meeting will be held on June 5.

SMALL-PLANT COAL COSTS IN MIDDLE WESTERN STATES

Annual Report of Board of Public Works of Holland, Mich., Shows How Fuel Increased in Price as Year Progressed

The annual report of the Board of Public Works of the city of Holland, Mich., for the fiscal year ended March 19, 1917, shows the cost of coal. During the year the city purchased for its electric light plant 6161.75 tons at an average of $3.33 per ton. The table herewith illustrates the extent to which smaller utilities in Middle Western States have been affected.

PROGRESSIVE COST OF COAL AT HOLLAND, MICH.

Tons	Price per Ton, F.o.b. Holland	Total Cost
833.25	$2.72½	$2,370.61
3,153.60	2.85	8,987.76
42.15	2.95	124.34
55.00	3.00	165.00
286.35	3.15	902.00
514.30	3.30	1,697.19
231.05	3.40	785.57
219.30	4.65	1,019.74
331.35	5.02	1,663.38
186.55	5.27	983.12
56.60	5.32	301.11
57.00	5.50	313.50
49.94	6.00	299.70
145.30	6.40	929.92
6,161.76	Avg. $3.33	$20,542.94

War Gardens Take Place of Athletic Field

Seven acres, lying at the foot of the hill topped by Nela Park, home of the National Lamp Works, Cleveland, have been taken over by employees, especially young women, who have determined to help conserve food supply and promote the Cleveland city war garden movement.

DETROIT MEETING OF AMERICAN ELECTROCHEMICAL SOCIETY

Attendance of 200 at a Profitable Gathering—Resolutions on Water-Power Legislation and Niagara Power Legislation

The thirty-first general meeting of the American Electrochemical Society, held in Detroit, Mich., from May 2 to 5, was attended by 200 members and guests, and was as good, enjoyable and profitable a meeting as any which this society, composed of members from so many different fields, has ever held. The headquarters were at the Hotel Statler, where all technical sessions were held. Edwin L. Crosby of the Detroit Edison Company was the chairman of the general local committee, and to him and to his colleagues on the committees from the Detroit Edison Company, from various automobile companies and from electric steel plants great credit is due for the careful arrangement and perfect execution of the whole program.

Investigation and Entertainment

The afternoon of Wednesday, May 2, was given over to a visit to the automobile factory of Dodge Brothers, which was particularly interesting to electrical engineers on account of the successful use of the electric japanning oven. The visit was followed by a very interesting motion-picture show relating to a Dodge car trip to the Pacific Coast and to the use of the automobile in war time. In the evening of Wednesday there was an enjoyable "get-together" subscription roadhouse dinner at West-Wood.

Thursday evening a smoker was held at the Hotel Tuller roof garden, with songs, refreshments, bulletins received by a wireless plant at work during the smoker, and a most elaborate play, "Research in Hell, a flight in two fast slides and one spiral dive, a futurist impression of the Mephistopheles electric-furnace research laboratory." It was a most elaborate affair—the joint product of the imagination and good nature of engineers for the Detroit Edison Company and from the Niagara Falls electrochemical fraternity.

For the afternoon of Friday three excursions had been arranged—a scenic automobile drive along the lake shore and through the residential districts, a visit to the Detroit Edison power houses, and a visit to the electric steel plants of the John A. Crowley Company and of the Michigan Steel Castings Company. At the former a 5-ton Groenwall-Dixon furnace is in operation and a 10-ton furnace in course of construction. The latter plant has two Heroult furnaces, one of 6 tons and one of 3 tons. Both plants get power from the Detroit Edison Company at the same rate which is charged for motor service.

For the evening of Friday a lecture by Alex Dow, president of the Detroit Edison Company, had been announced on "Electric Power from Coal," but unfortunately Mr. Dow was detained in the East and the session was called off. A theater party took its place.

A very fine and elaborate program had been arranged for the entertainment of the visiting ladies, Mrs. E. L. Crosby acting as chairman of the ladies' committee. Much credit is also due to Miss Edna J. Raybould of the Detroit Edison Company, who as secretary to the local committee was very active in looking after the correct execution of all arrangements.

The annual business session was held in the morning of Thursday, May 3. The annual reports were presented and the election of officers for the coming year was announced. Dr. Colin G. Fink of the Harrison (N. J.) works of the General Electric Company is the new president.

Water-Power Legislation and Niagara Power Legislation

The most important action of the business session was the adoption of resolutions on water-power legislation and Niagara power legislation. The former is to the effect that "in view of the mutual dependence of the futures respectively of the electrochemical industries and the development of water power in this country and the great importance of the matter to the nation as a whole the American Electrochemical Society believes that no legislation affecting water power should be enacted without giving a careful hearing to the electrochemists of the country."

The resolution on Niagara power legislation recommends "the formation of a joint commission containing representatives from both the United States and Canada, of the government engineers and of organizations interested respectively in the preservation of scenic beauty, in navigation, in electrochemistry, in power development, and so forth, and respectfully requests the administration of the United States government to take the initial steps toward the organization of such a commission, or to take such other action as may best forward the investigation urged by General Black and indorsed by the Secretary of War."

Both resolutions, which had originally been prepared by the committee on public relations and had been adopted by the board of directors, were approved and adopted unanimously by the society as a whole.

The retiring president, F. A. J. FitzGerald of Niagara Falls, then presented his very interesting and scholarly presidential address on the scope and work of the committee on public relations of the society (consisting of its past-presidents). He emphasized that no matter requires more careful consideration than that of cultivating in a democracy a true appreciation of expert advice.

Technical Sessions

The first technical session followed, and other technical sessions were held on Thursday afternoon, Friday morning and Saturday morning. In the whole twenty-seven papers were read and discussed.

The present rapid advance of the electric steel furnace was the subject of a paper by Dr. J. A. Matthews, while the practice of electric steel refining at the two Detroit electric steel plants was the subject of two papers, by R. F. Flinterman and J. L. Dixon respectively. Other electric furnace designs were discussed in papers by C. A. Buck and C. H. vom Baur, while A. A. Meyer of the Detroit Edison Company dealt in a very elaborate paper with the "electrical characteristics of electric furnaces" on the basis of many oscillograms from actual practice.

Prof. C. F. Hirshfeld of the Detroit Edison Company, in a paper on "Some Low-Temperature Electrothermic Processes," discussed a subject that should become of very great importance to central stations—that is, the substitution of electric heating for fuel heating for processes requiring comparatively low temperatures.

While the paper was chiefly restricted to two processes with which the author has had most extended experiences—electric japanning ovens and baking of cores for foundry work—a much wider field of application is manifest. The paper elicited a very lively discussion, which lasted through two sessions.

W. R. Mott of the National Carbon Company discussed very interestingly the chemistry of the flaming arc in relation to luminescence, while W. C. Brooks of the same company gave a good review of the functions, design and construction of storage batteries for automobiles. A paper by M. De Kay Thompson and L. R. Byrne dealt with the current efficiency in charging Edison storage batteries.

DR. COLIN G. FINK

With respect to electrolysis, a paper by W. E. Koerner (Harrison Lamp Works, General Electric Company) discussed the electrolytic behavior of tungsten, and a paper by M. De Kay Thompson and O. L. Mahlman on the electrolytic pickling of steel by the C. J. Reed process brought out the statement by Dr. Carl Hering that a large experimental plant using this process is in course of construction. Various electroplating papers were presented by Prof. F. C. Mathers, Prof. O. P. Watts and their co-workers.

Other papers of interest to electrical engineers were by W. W. Strong on the theory of the Cottrell electrostatic fume precipitation process, by T. T. Briggs, H. L. Pierson and H. S. Bennett on electrical endosmose and adsorption, and by T. W. Case on a cuprous oxide photochemical cell.

WORK OF DR. FINK

Dr. Colin G. Fink, the new president of the American Electrochemical Society, was born in New Jersey on Dec. 31, 1881. He graduated at Columbia in 1903 and from Ostwald's laboratory in Leipzig in 1907. Upon his return to America he entered the General Electric Company research laboratory of Dr. Whitney at Schenectady and there devoted himself to the metallurgy of tungsten. His discovery of ductile tungsten was announced for the first time at the American Electrochemical Society meeting at Pittsburgh in May, 1910. He introduced the tungsten wire process at the Edison Lamp Works of the General Electric Company at Harrison in 1910, and has been connected with these works ever since as head of the research laboratory. One of the important products of his laboratory is the platinum substitute leading-in wire, a compound copper or cobalt wire with a corrected expansion coefficient (English patent No. 23,775). This wire has been in universal use for a number of years and the conservation of platinum amounts to millions of dollars per year.

NEW YORK EDISON COMPANY ACTIVE IN RED CROSS WORK

Mrs. Thomas A. Edison Honorary Chairman in Preparedness Movement—Two Organizations Formed to Help

The New York Edison Company now has two very active Red Cross organizations. One, conducted under the auspices of the New York Companies Section, National Electric Light Association, is known as Auxiliary No. 3 of the American Red Cross, and the other is the New York Edison unit of the American Red Cross. Both are under the New York County Chapter.

The auxiliary, which is supported by voluntary contributions from the electric and gas companies, is a practical working organization, and since war was declared has turned out thousands of bandages and surgical dressings. The Edison unit confines its activities entirely to instruction work. Mrs. Thomas A. Edison is honorary chairman of this organization, which has arranged courses in dietetics, home care of the sick, surgical dressings, first aid work for men and first aid work for women.

Many employees of the New York Edison Company have already enrolled in these courses, which are also open to anyone wishing to take them. The instructors in dietetics are the Misses Mary Pascoe, Margaret A. Butler and Helen M. Curtis; in home nursing, Miss Grace Woodson; in surgical dressings, Miss Mabel F. Martin; in first aid, Dr. Frank Yeomans, Dr. Edgar Johnson and Dr. Creighton Barker. The executive committee consists of the Misses Margaret A. Butler, Frances T. Collet, Helen M. Curtis, Beatrice Danne, Mabel F. Martin, M. A. Gewehr, Mary E. Pascoe, Grace Woodson, Cyril Nast and Clarence L. Law. Miss Winifred E. Black is chairman, Miss Ina J. Zimmer secretary and Miss Anne Broome treasurer. The classes are held evenings at 124 West Forty-second Street.

A RED CROSS LECTURE TO NEW YORK EDISON WOMEN

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

New Jersey Commission Reopens Telephone Case.—The New Jersey Board of Public Utility Commissioners has ordered a reopening of the New York Telephone Company case, covering an investigation of rates, to take additional testimony bearing upon the earnings and cost of operation. At the same time the board will investigate rates of the Delaware & Atlantic Telegraph & Telephone Company, operating in the Camden district. The Delaware & Atlantic company is a subsidiary of the Bell Telephone Company.

California Decision on Railway Power Contract.—The California Railroad Commission has fixed $0.0085 per kilowatt-hour as the rate for electricity sold by the San Joaquin Light & Power Company to the Fresno Traction Company for operating the latter's electric railway line, and the same rate is to apply to all other consumers of the San Joaquin company receiving service under conditions substantially similar. The rate applies to all electricity delivered after May 1, 1916. This rate was fixed by the commission in the complaint of the traction company against the San Joaquin corporation. The traction company says that the power corporation charged it rates under schedules fixed by the commission on April 6, 1916, in the San Joaquin rate cases, and that this price was too high. The power corporation stood on the commission's schedules and asked that the complaint be dismissed. Transportation of large crowds from various places of amusement on the San Joaquin River on Sundays and holidays in the summertime greatly increases the normal demand for electricity of the traction company. The traction company, says the commission in its decision, did not appear at the public hearings and did not draw attention to these unusual conditions, although the effect of the new rate increased the cost of electric service to the traction company 13 per cent, on account of the abnormal short peaks of the amusement business. The commission says that while it is not clear that the rate established for large consumers is in excess of the service to the traction company conditions may arise which would warrant the continuance of a rate less profitable on the average, and in view of the circumstances the commission restores the contract rate of 8.5 mills per kilowatt-hour, but subject to reconsideration upon the application of either party, or upon action by the commission, should service conditions of either the power system or the traction company change materially. The companies agreed that the decision should apply from May 1, 1916.

Values in Portland, Ore.—A report of the Oregon Public Service Commission on the value of the Portland (Ore.) Railway, Light & Power Company property has been issued. It fixes a value for rate-making purposes of $46,862,972, or approximately $14,000,000 less than the valuation made by engineers of the company. Total value of the properties was placed at $55,307,474, of which $8,444,502 is found to be non-operating utility property. Values of the electric utility properties are declared to be $19,492,153, of which $17,689,980 is in Portland.

California Commission on Debentures.—The California Railroad Commission has authorized the San Joaquin Light & Power Corporation to sell $1,000,000 of 6 per cent ten-year debentures at not less than 95. The proceeds are for expenditures already made, for additions and betterments, or improvements planned and scheduled with the commission. The trust agreement securing the issue restricts the amount of floating indebtedness, provides for the protection of the status of the debentures, contains provisions in event of default and guards against the interposition of any additional mortgage. The company is now able to sell its bonds at approximately par, and already has a market for these debentures at 95. It will thus obtain its notes at reasonably low cost, and through the elimination of previously heavy discounts on its securities will be able to avoid the complications of a burdensome floating indebtedness. At the same time, says the commission, it is well for the corporation to hold in mind that a debenture lacks the element of permanency and will therefore in the end prove less satisfactory than some form of high-class stock issue. The commission believes that the company should have in mind some plan which may eventually permit these debentures to be converted into stock. It is the intention of the corporation to resume dividends of 6 per cent upon its preferred stock. The commission says that it can only view with satisfaction and pleasure the evidences of financial strength on the part of a public utility under its jurisdiction, particularly when such financial strength comes from a rate revision by which the consumers are permitted to share with the stockholders the benefits of public regulation. This refers to the commission's decision of a year ago which lowered electric rates, but so great has been the increase of the company's business that it reports the largest earnings in its history. The rate reductions have served to stimulate business and have increased the profits. Among the expenditures for additions and betterments are $114,000 for the completion of the Kern Canyon plant, $185,000 for completing the construction of the Henrietta substation to Corcoran, $60,000 for new substations at Merced Falls, Merced and Alpaugh, $75,000 for boilers and new circulating water-cooling system at the Bakersfield steam plant, $72,000 for transmission lines from Raymond to Merced Falls, and various other items of a similar nature to these, providing for new construction and equipment.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public-utility companies.

Expert Testimony.—The testimony of persons not possessing engineering skill or knowledge of hydraulics as to the capacity of and amount of water carried by ditches, being mere guesses, was inadmissible as expert testimony, the matter being susceptible of exact measurement, it was held by the Supreme Court of California in the case of Northern California Power Company, Consolidated, versus Waller (163 P. 214). It is the general rule that whenever possible data to establish given conditions must be introduced in evidence, and if scientific knowledge is necessary, this may be given by the opinion of experts; but, where not possible, opinions of ordinary witnesses are admissible as being the best evidence.

Right of Municipality to Order Wires Underground.—A telegraph company, though entering on use of a street under the federal post road act of 1866, may be required by the city under its police power to put its wires underground, the Supreme Court of Michigan held (192 N. W. 76). A telegraph company by use of street for poles and wires for fifteen years does not acquire a prescriptive right preventing the city under its police power to require the placing of the wires underground. It not appearing by what right an electric railroad uses a street and its trolley wire being in the middle of the street, it cannot be said the city discriminated in requiring removal of telegraph poles at the side of the street and the placing underground of the telegraph wires.

Damages for Backwater.—A court which charges the negligent permitting of logs, etc., to be and remain upon land, with a knowledge that injuries would arise by having the same submerged by water, and avers that the defendant had the authority to back this water, and shows that the injuries would not have arisen but for the backing of water, and although averring that it became defendant's duty to remove the vegetation as a matter of law, does not charge that the water was negligently backed, was held by the Supreme Court of Alabama to have made a defective charge subject to demurrer, in Burnett versus Alabama Power Company (74 S. 459). To establish negligence under an averment that defendant by means of a dam negligently caused water to back, producing injuries set forth, the dam must be shown to have been negligently or wrongfully constructed or maintained. Consequently damages to persons caused by the decay of the submerged vegetable matter involve no injury to property which is recognized by law.

Yosemite Power Company Refused Permit.—Secretary of the Interior Lane has refused the application of the Yosemite Power Company for a permit to use the Poopenaut reservoir and incidental works and rights-of-way within the Yosemite National Park.

Certificates of Merit for Inventors.—The Inventors' League has decided to grant a "certificate of merit" on inventions of its members which are submitted to a board of examiners and approved as entitled to such honors in the various branches of science and invention. Awards will be made once or twice per year as the board may direct.

Union Gas & Electric Bond Canceled.—As the Union Gas & Electric Company, Cincinnati, has refunded excess payments by patrons, with the exception of about $300, in the controversy with the city, the Public Utilities Commission has authorized the cancelation of its surety bond for $50,000 and the issue of its own guarantee until the balance is paid.

Columbus Municipal Plant May Sell Service Outside the City.—The service committee of the City Council, Columbus, Ohio, has decided to return a favorable report on an ordinance authorizing the sale of surplus energy from the municipal electric plant to persons living outside the city limits at 7 cents per kilowatt-hour. Nonresidents must assume the expense of extensions of service.

"Electrical Party" at University of Minnesota.—Students of the electrical engineering department of the University of Minnesota gave an "electrical party" recently to their friends. Of the numerous electrical exhibits the tin-can motor and the talking arc light won most attention. Other favorite "stunts" were a "bucking" motor, lightning discharge to a house and an all-electrical home; 300,000-volt insulator tests with a new Thorardson transformer were also made, showing corona and flashover. Five hundred guests were present.

Increased Operating Expenses Expected in Republic Group.—Gross earnings of the subsidiaries of the Republic Railway & Light Company, the operating headquarters of which are at Youngstown, Ohio, increased from $3,121.297 in 1915 to $3,987,616 in 1916, or 27.75 per cent. Net earnings increased from $1,247,214 in 1915 to $1,660,209 in 1916, or 33.11 per cent. The gross revenue from electric light and power business increased 37.5 per cent. The kilowatt-hour output increased 41 per cent. Harrison Williams, the president, says that substantial increase in cost of materials, particularly coal, will result in increased operating expenses for 1917. The demand for electrical energy, particularly from large power users, has developed so rapidly that work has been begun upon an extension which will increase the rated capacity of the Lowellville (Ohio) generating plant from 40,000 to 60,000 hp. This is to be completed in 1917 and it follows an increase from 20,000 hp. to 40,000 hp., completed last year.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Rate Reduction in Fargo, N. D.—Beginning May 1, the Northern States Power Company reduced the maximum electric rate in Fargo, N. D., from 9.9 cents to 8 cents net per kilowatt-hour. Other reductions were also made. The minimum monthly charge will be 75 cents instead of $1.

Telephone Company Takes Ohio Commission Into Court.—The Lima Telegraph & Telephone Company, Lima, filed suit in the Ohio Supreme Court on May 1 to test the valuation placed on its property by the Public Utilities Commission for rate-making purposes. The valuation fixed is $1,004,340, which the company contends is insufficient.

Daylight Saving in Kentucky.—An ordinance passed at Lexington, Ky., providing that the daylight-saving plan shall go into effect has aroused opposition from retail merchants. In all probability the measure will be rescinded. The merchants urged that it would not be practicable to adopt the plan unless all others in the vicinity and the country as well were to do so.

Cooking Rate in Kansas City.—The Kansas City (Mo.) Light & Power Company, in announcing its acceptance of the Public Service Commission order to reduce rates, made also a voluntary rate of 3 cents for cooking. It also announced prospective reductions in the lighting rate as the number of consumers increases. The cooking rate also will be reduced further as business grows. The company is spending $1,000,000 on new equipment for its generating stations, pending the erection of the six-million-dollar plant at Kansas City.

Municipal Ownership Defeated in Independence, Kan.—By a vote of considerably over two to one the people of Independence, Kan., decided against the installation of a municipal electric plant. The proposal was to issue $75,000 in bonds. A very aggressive campaign, led by a local newspaper, had been conducted for the plan for over a year. The first petition calling for a special election failed on account of the lack of sufficient names to make the petition legal The final petition had less than twenty names in excess of the legal requirements. When the election was called the Kansas Gas & Electric Company engaged Glenn Marston of New York to place the municipal-ownership proposal before the people from the company's point of view. Advertisements were carried daily in the leading papers, in which a detailed analysis of the size of plant which could be built for $75,000 was given.

Power Contracts of Mahoning & Shenango System.—Three large power contracts, totaling 2400 hp., have been closed by the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio. One, for approximately 1500 hp., will electrify a large section of the plant of the Crescent Portland Cement Company, Crescentdale, Pa. Another, for 600 hp., will be for the entire power requirements of the Ohio Steel Products Company, Mineral Ridge, Ohio. The third, for 300 hp., will cover the requirements of a new plant of the Valley Mould & Iron Company of Sharon, Pa., which is being rushed to completion at West Middlesex, Pa.

Narragansett Company Builds Line to Westerly, R. I.—The Narragansett Electric Lighting Company, Providence, R. I., is building a 30-mile, 33,000-volt transmission line of two circuits from Apponaug to Westerly, R. I., tying the Westerly system owned by these interests into the system centering at Providence. Through connections with the New England Power Company Rhode Island and Massachusetts are now tied into a comprehensive system of high-tension transmission, and the completion of a 66,000-volt line from Clinton, Mass., to Sudbury in the Framingham district will connect the Boston Edison Company's system with the New England hydroelectric network.

Annual Report of Detroit Public Lighting Commission.—The twenty-first annual report of the Public Lighting Commission of Detroit, covering the year to June 30, 1916, made by J. T. Lynn, the president, says in part: "The number of arc lamps in operation June 30, 1916, was 9544. The average number operated throughout the year was 8795. The cost of $212,480 for arc lighting, divided by the average number of arc lamps in operation, gives the cash cost of operation and maintenance at $24.16 per year per lamp, or 12 cents per lamp less than the cost for the preceding year. It is only by the practice of the most rigid economy in the operation of the plant, by the careful purchase of supplies and by the employment of all labor in as efficient a manner as would be practiced by the best private corporations that a reduction in the cost of the lighting has annually been secured. For the ensuing year, however, there will be a decided increase in the cost of public lighting. The change from a seven-day-week to a six-day-week service for employees will cause considerable increase in the payroll. Add to this the requirements of the minimum-wage amendment to pay any employee in any class at the highest prevailing rate paid in the city and increased cost must be expected. It is such handicaps that make municipal operation of public utilities inefficient, costly and a burden to the taxpayer. The necessity of providing for fuel shortage has been forcibly brought to our attention during the recent railroad embargoes. Had it been possible to store coal during the summer months, about $30,000 would have been saved this year."

Jovian League of Toledo.—Arrangements have been made for a series of luncheons by the Toledo Jovians in order to engender enthusiasm for a campaign to obtain the next Jovian gathering for Toledo.

South Dakota Electric Power Association.—The next annual meeting of the South Dakota Electric Power Association will be held at Sioux Falls, S. D., May 13 and 19, with headquarters at Hotel Carpenter. A. H. Savage is secretary of this association.

Institute of Radio Engineers.—"Iron at Radio Frequencies" will be discussed by Prof. Michael I. Pupin, president of the Institute of Radio Engineers, at its next meeting. This meeting will be held May 16 in the Engineering Societies Building, New York City.

Iowa Electrical Contractors' Association.—The next meeting of the Iowa Electrical Contractors' Association will be held May 24 and 25 at Des Moines in conjunction with the Iowa Street Railway Association. M. T. Humphrey of Waterloo is secretary of the association.

Pittsburgh Section, A. I. E. E.—Offcers of the army and the marine corps addressed the Pittsburgh Section of the American Institute of Electrical Engineers on May 8. The subjects were "The Electrical Engineer's Part in Modern Warfare," "The Marines and Their Duties" and "Army Service."

Cleveland Engineering Society.—Major P. S. Bond of the United States Engineers' Reserve Corps addressed 150 members of the Cleveland Engineering Society, following a noon luncheon, on April 27. He announced that forty or more members of the society will be asked to attend the army training camp at Fort Benjamin Harrison. Ten members of the organization now hold commissions and about thirty more have applied for them. The members have been asked to find out the work for which they are best fitted before they enlist.

New-Business Meeting, Ohio Electric Light Association.—The following program for the next meeting of the new-business co-operation committee of the Ohio Electric Light Association, at the Hotel Ohio, Youngstown, May 16, has been arranged: Address of welcome by R. T. Sullivan, general manager Mahoning-Shenango Railway & Light Company, Youngstown; "Promotion of Appliance Sales," by C. H. Felker, sales manager Columbus Railway, Power & Light Company; general discussion on what is being done in sales department to help overcome increased operating costs and the necessity of increased rates to maintain net income; luncheon address by Charles A. Leedy; "The Sale of Company Stock to Employees and Customers," by T. O. Kennedy, general manager Massillon Electric & Gas Company, Massillon, Ohio; "Electric Furnaces," by C. I. Crippen, Mahoning & Shenango Railway & Light Company, Youngstown, Ohio; inspection trip to Lowellville generating station. J. E. North of Springfield is chairman of the new-business co-operation committee.

Associations and Societies

A complete Directory of Electrical Associations is regularly printed in the first issue of each month on the next-to-last text page.

Electrical League of Cleveland.—Worcester R. Warner, president of the Warner & Swasey Company, recently addressed the Electrical League of Cleveland on the subject of astronomy.

Jovian Electric League of Los Angeles.—At the weekly luncheon on May 2 Frederic T. Woodman, Mayor of Los Angeles, spoke on "Municipal Affairs." Harry N. Sessions, first tribune of the Jovian Order, acted as chairman of the day.

American Association of Engineers.—On May 14 and 15 the American Association of Engineers will hold its third annual convention at Chicago to elect officers for the ensuing year and to consider proposed changes in the constitution.

Advertising and Selling Problems.—Elliot Reid, advertising manager of the Westinghouse Lamp Company of New York City, addressed a joint meeting of the St. Louis Jovian League, the "ad men" and the St. Louis Chamber of Commerce, at the Mercantile Club in St. Louis, May 1. Taking for his subject "Advertising and Selling Problems We Have Met," he gave valuable information gathered from experiences in connection with his work during the last few years. One of the features of his address was a description of how the monthly magazine *How I Did It*, published by his company, with salesmen as contributors, had resulted in benefits far beyond the expectations of the officers. Frank A. Beardslee, sales manager Union Electric Light & Power Company, was chairman. About 500 members of the three organizations were in attendance.

Station Operating Committee of the O. E. L. A.—The station operating committee of the Ohio Electric Light Association held its final meeting of the season at the Hotel Gibson, Cincinnati, Ohio, on April 24. F. R. Brosius of the Union Gas & Electric Company, Cincinnati, presented a paper on "Some Economies Effected in Power Stations, and Savings Possible." The paper and the discussion which followed dealt with the practicability of raising the requirements for firemen. Firemen have usually been selected on the basis of physical qualifications rather than mental ones. The central station business has developed in such proportions, however, that it is now necessary in the interest of economy to engage men who have brains as well as physical endurance. H. B. Dates said that recently the private plant at the Case School of Applied Science effected a great economy by changing firemen in the plant and paying the new men double the wages of the old. H. W. Bromley, superintendent of power for the Youngstown & Sharon Street Railway Company, pointed out that plant economies may be much improved by attention to the application and grade of lubricant. At Youngstown, with a yearly output of 135,000,000 kw.-hr., the plant is operated with a lubricant expense of 0.25 mill per 1000-kw.-hr. generated. One grade of oil is used. "Watch your ash pile" was the burden of a discussion on the contention that 25 per cent of nearly every ash pile is carbon. Benjamin Greenfield, efficiency expert for the Henry L. Doherty Company, discussed the use of CO_2 recorders as a means of increasing economy. He said that if the meters receive proper attention they will give accurate results. D. L. Gaskill, secretary of the Ohio Electric Light Association, gave an impromptu talk on the value to the executive of the operating engineers. "Firebricks" was the subject of a paper by W. A. Heisel of the Charles Taylor Sons Company. He discussed the subject from the angle of the various uses of the refractories in the boiler room. The fields for silica brick, chrome brick, magnesite brick and bauxite were defined. Through a better selection and knowledge of the use of the material and through painstaking care in designing the work, particularly in furnaces where arches are employed, much trouble can be avoided. Analysis of a firebrick alone does not afford the best way to judge its suitability for the work intended, as the analysis merely shows the composition of the brick without giving any information as to its physical properties, which are usually more important than the chemical composition. Furthermore, the analysis does not reveal the way in which the impurities occur, which is very important in determining the temperature to which bricks may be subjected without danger of failure. The qualities of coal must also be considered in selecting the corresponding refractory material. At the luncheon, which was held at the Hotel Gibson, W. W. Freeman, president of the Union Gas & Electric Company, said that the association members are in a position to play an important part in the coming war crisis and that on their shoulders rests the responsibility of operation of the great industries which will feed and equip the armies of the country. H. L. Lawrence, test engineer for the American Engineering Company, Philadelphia, presented a paper on "Stoker Operation as Found in the Ordinary Plant and as It Should Be." "Pressure Drops in Superheaters and Dry Pipes" was the subject of a paper by George Coughlin, results engineer of the Toledo Railways & Light Company. He gave several reasons for the use of superheated steam in connection with steam-engine operation. Following the afternoon session, the committee members were entertained as guests of the Union Gas & Electric Company in an inspection trip to its new West End power station, which represents a total investment amounting to about five million dollars.

L. B. HERRINGTON

Men of the Industry

Changes in Personnel and Position—Biographical Notes

L. B. Herrington, recently elected vice-president in charge of operations of the Kentucky Utilities Company, is a native of Atlanta, Ga., and is a graduate of Central University of Kentucky and the Mercer University (Georgia) Law School. Mr. Herrington entered the public utility business in 1905, when he built the station at Richmond, Ky., and became president of the Richmond Electric & Power Company. Succeeding in that enterprise, in 1912 he bought and rebuilt the electric plant at Gallipolis, Ohio, which was under his management until recently sold to the Ohio Utilities Company. He and his Richmond (Ky.) associates built and operated the telephone system at Orlando, Fla. Mr. Herrington has been identified with the legal department of the Kentucky Utilities Company since its organization, looking after its franchises and municipal contracts and negotiating the purchase of several of its properties. He brings to his new executive position the training and experience of a lawyer, legislator, builder, owner and operator of public utilities. He is thirty-seven years old.

D. A. Hegerty, president of the Texas Southern Electric Company, Houston, Tex., has been elected first vice-president of the Southwestern Electrical and Gas Association. Mr. Hegerty entered the electric lighting field from the railway field, having been associated with A. Langstaff Johnson in the electrification of the street railways of Philadelphia and later being connected in an official capacity with the Hestonville, Mantua & Fairmount Passenger Railway of that city, the Norfolk (Va.) Railway Company and the Railway Companies General. For several years he was general manager of the Little Rock Railway & Electric Company and later manager of the lighting department of the New Orleans Railway & Light Company. In February, 1914, he became general manager of the Houston Lighting & Power Company, resigning in the fall of the following year to take up his present work. Mr. Hegerty is a past-president of the traffic and transportation branch of the American Electric Railway Association.

C. A. Matthews has been appointed superintendent of the power and light department of the Northwestern Ohio Railway & Power Company, Toledo, Ohio. In addition to the duties that he has assumed with this company, Mr. Matthews will continue as superintendent of the Port Clinton (Ohio) Electric Light & Power Company.

C. B. Kennedye, who was recently appointed sales manager of the Light & Development Company of St. Louis, Mo., was born at St. Louis in 1880. He was graduated from Polytechnic College, Fort Worth, Tex., with the class of 1905. During summer vacations Mr. Kennedye worked for the Fort Worth

C. B. KENNEDYE

Traction Company and the Commonwealth Edison Company of Chicago. After graduation he spent one year in the employ of the St. Louis Brass Company and then three and one-half years in the industrial power department of the Union Electric Light & Power Company of St. Louis. After that he left the utility business for a short period to act as state treasurer of Missouri for the organization of the Progressive party. With the closing of this campaign he entered the new-business department of the Light & Development Company, carrying out sales work at some of its forty-four properties under the direction of W. A. Smith, vice-president of the company. Since the death of Mr. Smith Mr. Kennedye has continued his interest in the sales department, of which he has now been made manager. Mr. Kennedye was a member of the winning St. Louis Jovian degree team which took the cup at Chicago in 1915, and was recently awarded the Vulcan degree for conspicuous work on the one-hundred-point committee of the organization.

E. T. Rowland recently resigned as sales manager of the United Illuminating Company to become new-business manager of the Continental Gas & Electric Corporation with headquarters at Omaha, Neb.

A. B. Paterson has resigned the general managership of the Meridian (Miss.) Light & Railway Company to take up the duties of bond department representative of Henry L. Doherty & Company in New Orleans and contiguous territory, with headquarters in that city.

Obituary

Louis R. Pomeroy, well known as a consulting engineer in railway and electrical fields, died suddenly at his home in Orange, N. J., on May 7. Mr. Pomeroy was born at Port Byron, N. Y., in 1857, and was graduated from the Irving Institute at Tarrytown, N. Y. He early entered the railroad field, where his work attracted considerable attention. From 1886 to 1890 he was a special representative of the Carnegie Steel Company, introducing basic boiler steel for locomotives and special forgings for railways. For nine years he was engaged in similar work with the Cambria Steel Company and the Latrobe Steel Company jointly. He then became connected with the Schenectady Locomotive Works as assistant general manager, a position he held until 1902. During the following six years he was a special representative for the General Electric Company in the railway field, this work covering the electrification of steam roads and railway shops and the general application of electricity to all railway purposes. Subsequently for two years he was assistant to the president of the Safety Car Heating & Lighting Company, leaving to become chief engineer of the railway and industrial division of J. G. White & Company. Late in 1911 he resigned to open an office in New York City as a consulting engineer. In 1914 he became associated with the United States Light & Heat Company as manager of the New York office. For the past year or so Mr. Pomeroy had again been engaged in consulting work.

LOUIS R. POMEROY

REVIEW OF TRADE AND MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

ENLISTMENT IN ENGINEERING CORPS AROUSES CONCERN

Manufacturers Lose Many Valuable Men from Engineering Departments and Branch Offices Because of Government's Call

Electrical manufacturers view with apprehension the daily enlistments of their men in the engineering corps. Engineering departments, of course, have been the ones to suffer most in this respect. There has been, however, a very serious depletion in the ranks of branch officers. In most instances the men who have joined the engineering corps of the army are the younger men who come within the now tentative age limits of the conscription bill.

Being men of highly trained technical ability along lines of manufacture and distribution rather than along lines of construction and field work, the manufacturers are finding it very difficult to replace them. If the government is to require these factories to build materials for war purposes, the loss of these men will, of course, be felt by it. The wisdom of taking engineers from manufacturing establishments without a more careful analysis of their value to the industry and to the government while employed in that industry is somewhat dubious.

FLASH-LAMP BATTERY MANUFACTURERS SWAMPED

Impossible to Supply Demand of Europe for Refilling Purposes—Prices for Exports Are Expected To Advance

Manufacturers of flash-lamp batteries are expecting a larger volume of business in 1917 than last year, although 1916 was the best year that has ever been experienced in the history of the trade. Domestic business keeps up strongly and is growing continually. The government has already placed some fairly large orders both for the navy and the army, and it is understood that it is making inquiries for still further shipment. Because of the great mobilization camps which will spring up for the training of the 500,000 men that this government intends to call to the colors shortly, domestic business will be greatly enhanced.

However, the really large business at the present time is that from Europe, where, owing to war restrictions on lighting, flash-lamps are having an enormous use. The allied governments have taken over sufficient production to take care of the trench and warfare trade. For domestic use, however, the United States, it is understood, is supplying 60 per cent of the volume used, England about 20 per cent, with the remaining 20 per cent going to Sweden, Spain, Denmark and other countries.

There is very little demand for cases. Practically all of the demand now is for batteries for refilling purposes. It is understood that for every battery turned out in this country there are three buyers. In other words, the demand in the market is practically three times as great as production. It is known that there are certain large jobbers in London who, if it were possible to obtain deliveries, would place to-day orders for many millions of flash-lamp batteries. Manufacturers, however, are absolutely swamped and are not in a position to take on any greater volume of business than they now are doing.

Domestic prices have not advanced, although there has been a feeling in the market that an advance may go into effect almost any time. For the export trade, however, an advance of approximately 16 per cent will go into effect in June. Prices of all materials entering into the construction of batteries have increased, and it would not be strange, therefore, if the domestic price should increase accordingly.

It has been noted that the trade is not stocking up as heavily as formerly, preferring rather to buy in smaller quantities and more often. This, it is understood, is owing to the uncertainty of the market. Jobbers and dealers do not care to stock up heavily on goods that might by any possibility decrease in value while on their shelves.

Manufacturers are finding less difficulty now, it has been noticed, in securing raw materials for production. The metals, particularly, are coming in better than since the war began.

CENTRAL STATION PLANS FOR CONSTRUCTION HALTED

Tendency Noted to Withhold Purchasing of Line and Generating Equipment Until Lower Prices Prevail

It has been noticed during the last few weeks in many sections of the country that central stations are no longer buying for new construction and developments with the same freedom that they did last year. In fact, it has now become a decided policy in many stations not to increase line or generating facilities until prices become much nearer normal. A considerable falling off in line equipment, especially poles and line hardware, has been noticed of late.

Many central stations are now loaded up to the extent of their generating capacity, and some have definitely decided not to take on new customers without placing in their way almost prohibitive restrictions. One large company in the East, it is known, has recently received a power contract necessitating a reduction in the output to other customers. It was thought advisable by this company to take such a step rather than increase generating and distribution facilities.

It is understood that there is a very large stock of line hardware and poles on hand laid in in anticipation of an increase in spring construction. This decision of the central station companies to defer betterments and additions until lower prices shall result will undoubtedly act as a severe hardship on many jobbers, as well as manufacturers, engaged in handling this class of material.

DISTRIBUTION PROBLEM OF THE ELECTRIC VEHICLE

Branch Offices Only in Very Largest Centers, Relying on Dealers in Smaller Cities, Found Best Method by Large Manufacturer

Electric vehicle manufacturers have in the past looked upon the central stations as the essential factor in the distribution of their products, but the fallacy of that kind of promotion is now evident, and manufacturers are discussing means of distribution. As the result of a broad study of this problem, the largest manufacturer of commercial electric trucks in the United States during the last three years has gradually opened up a wide field of distribution through dealers, and now has the foundation for a high-class dealer organization throughout the United States and a distribution, through foreign representation, all over the world.

The original dealer plans of this company were to exploit through central stations, acting as selling agents. It was found, however: (a) that barring two or three exceptions

they were not interested; (b) that their organizations were so large as to be unwieldy and unproductive on such a highly specialized proposition; (c) that their operation departments were not inclined to co-operate with their commercial department by using electric trucks; (d) that their commercial department was not as active as were competing gasoline truck salesmen.

The present policy of this manufacturer is to secure dealers in every city with more than 55,000 population and, other things being equal, to give preference in the following order: (a) organizations with garage facilities; (b) central stations; (c) individuals without previous electric vehicle experience whom it can train to sell.

The feeling exists that it is better business to have a good dealer in the city of Birmingham, Ala., for instance, than to try to cover that city from an office in Atlanta, for the reasons that the dealer knows most of the business men around him and can "cash in" on the disposition to patronize a brother townsman, that he is familiar with local conditions, and that he can afford to develop "prospects" patiently.

Even at the cost of a substantial discount, this company has found it to be generally to the manufacturer's advantage to sell through a dealer. In the long run it is cheaper, except in large centers, for where he can sign up a dealer for a definite number of trucks per year it steadies his production and distributes the burden of introductory selling.

For several years to come, however, this company believes that it probably will be difficult to secure in the quantity desired good electric truck dealers, because it is hard to get the prospective dealer to see that while it takes a little longer to break the ice with the electric vehicle, once the ice is broken in a locality, care being used to adapt each truck properly to its work, the reorder business on the electric will be greater and more sure than that on the gas truck.

Exploiting of the commercial electric car, especially from the standpoint of avoiding mis-sales, of course requires education as to the features of superiority shown by the commercial electric over other types of commercial vehicles, as well as a knowledge of its limitations.

In the past this has made it particularly difficult to secure effective dealers, but as time goes on and a knowledge of the characteristics of the electric vehicle becomes more broadly disseminated, this condition, it is noticed, is changing, although the decision of any company as to its policy must necessarily rest upon its own individual conditions.

It becomes evident therefore that any company in deciding the problem of securing distribution for its product should take into consideration the size and location of such distributing center and the potential business or demand for that product. Direct representation where such representation is financially profitable is apparently the best method to pursue in the very largest centers.

Conditions have now developed to the point where the policy of dealer representation in the smaller centers is effective. Undoubtedly this is primarily due to the fact that individual dealers are becoming better informed regarding the efficiency of the electric vehicle, but there is still much to be done in educating the dealer.

PRICE OF INCANDESCENT LAMPS NOT TO INCREASE

New Contracts to Be Signed on Same Terms as Last Year Except Perhaps for Metallized-Filament Lamps

Some accounts have appeared in the papers of late which would leave the impression that the price of incandescent lamps has recently been advanced. Investigation, however, shows this idea to be entirely unfounded. There have been a few slight changes in discounts, but none of these have tended to increase the price of lamps.

Not only have lamps not increased in price, but in spite of the fact that materials and labor have increased manufacturing costs considerably manufacturers are not now contemplating any increase. It is true that a number of economies of manufacture have been developed, but they have not been able to take care of the entire increase in production cost. Many of the large lamp contracts run out this month, and there is no doubt that they will be signed up for another year under the same terms and prices as for the past year.

The 50-watt tungsten lamp which was offered to the industry about two years ago at a price slightly higher than the 40-watt and 60-watt sizes has recently been lowered in price, the stipulated volume of production having been secured. When this lamp was put on the market the industry was promised that it would be placed on a par with the 40-watt and 60-watt sizes as soon as production warranted, and now all three are listed at the same price.

Since the advent of the tungsten lamp on the market the sale of the metallized-filament lamp, which up to that time was the standard lamp, has fallen off to a very great extent. Because of limitations in manufacture it has never been possible to produce this lamp for exact voltages, and therefore a peculiar system of marketing whereby certain stations used lamps of a certain measured voltage, other stations lamps of another voltage, and so on, became necessary. It was only in this way that the entire number of lamps could be used up and production costs kept to a minimum. Now, however, fewer and fewer stations are using these lamps, although the range of voltages in production remains the same. It therefore becomes necessary either to increase the voltage range per station or to break up the lamps of extreme voltage and consequently increase production costs. Should it not be possible to substitute rapidly in those stations using the metallized-filament lamp tungsten lamps for them, the second procedure would probably become necessary. In this event an advance in price would undoubtedly follow. In fact, all new contracts for the metallized-filament lamp will probably give to the manufacturer the right to increase prices during the period of the contract should production cost make it necessary. While no definite action has been taken on this, it seems probable that any increase would be limited to not more than 10 per cent in any one year.

TREND OF INQUIRIES IS TO STRENGTHEN METAL MARKET

Actual Sales Have Been Few, and Rumors Have Been Quickly Followed by Denials in Nearly All Instances

After a slump for a number of weeks, the general tone of the entire metal market is stronger. Copper, tin and lead are higher than a week ago; spelter is lower. Rumors of inquiries for large tonnages have largely been responsible for the hardening. There have been few actual sales, and for the most part the rumors have been quickly denied. With so many rumors, even though followed by denials, the old saying that where there is smoke there is pretty sure to be fire seems particularly apt.

Copper quotations for the remainder of 1917 were nominally as follows for electrolytic on Tuesday last: May, 32.75 cents; June, 31.75 cents; July, 30.25 cents; third quarter, 29 cents; fourth quarter, 27.50 cents.

NEW YORK METAL MARKET PRICES

	May 1 Selling Prices Bid £ s d	May 1 Selling Prices Asked £ s d	May 8 Selling Prices Bid £ s d	May 8 Selling Prices Asked £ s d
Copper:				
London, standard spot	130 0 0†		130 0 0	
Prime Lake	30.50 to 31.00†		31.50 to 32.50†	
Electrolytic	31.00 to 31.50†		32.50 to 33.00†	
Casting	27.50 to 28.50†		29.50 to 30.00†	
Copper wire base	36.50 to 37.50†		36.50 to 37.50†	
Lead	9.00		9.50	
Nickel	50.00		50.00	
Sheet zinc, f.o.b. smelter	19.00		19.00	
Spelter, spot	9.55 to 9.67½		9.30 to 9.42½	
Tin, Straits	58.50		59.50	
Aluminum, 98 to 99 per cent	56.00 to 58.00†		56.00 to 58.00†	

OLD METALS

Heavy copper and wire	25.50 to 26.50	26.50 to 27.00
Brass, heavy	16.00 to 16.50	16.00 to 16.50
Brass, light	12.00 to 12.50	12.50 to 13.50
Lead, heavy	7.50 to 7.75	8.00 to 8.25
Zinc, scrap	6.50 to 7.00	6.50 to 7.25

†Nominal.

Current Prices of Electrical Supplies

The prices quoted are those prevailing in standard package or specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists to contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East, its nearness to the sources of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers.

ARMORED CONDUCTORS, FLEXIBLE STEEL

Single-Conductor

B. & S. Size	List, per 1000 Ft. Chicago	N. Y.
No. 14 solid	$61.00	$61.00
No. 12 solid	71.00	71.00
No. 10 solid	90.00	90.00
No. 8 solid	106.00	106.00
No. 6 solid	145.00	145.00
No. 10 stranded	95.00	95.00
No. 8 stranded	115.00	115.00
No. 6 stranded	160.00	160.00
No. 4 stranded	205.00	205.00
No. 2 stranded	266.00	266.00
No. 1 stranded	315.00	315.00

Twin-Conductor

No. 14 solid	104.00	104.00
No. 12 solid	135.00	135.00
No. 10 solid	185.00	185.00
No. 8 stranded	235.00	235.00
No. 6 stranded	370.00	370.00
No. 4 stranded	575.00	575.00

DISCOUNT PER 1000 FT.

Single-Conductor

No. 14 solid:	Chicago	N. Y.
Less than coil	+10%	Net
Coil to 1000 ft	—10%	3%
No. 12 solid:		
Less than coil	+10%	Net
Coil to 1000 ft	—10%	3%

Twin-Conductor

No. 14 solid:		
Less than coil	+10%	Net
Coil to 1000 ft	—10%	3%
No. 12 solid:		
Less than coil	+10%	Net
Coil to 1000 ft	—10%	3%

ATTACHMENT PLUGS

	Std. Pkg.	List Chicago	N. Y.
Benjamin No. 903	100	$0.25	$0.25
Hubbell No. 5406	250	.30	.30
Bryant No. 706	100	.25	.25
G. E. 50996	250	.22	.22

Discount	Chicago	N. Y.
Less than 1/5 std. pkg.:		
Benjamin No. 903	12%	10%
Hubbell No. 5406	+10%	10%
Bryant No. 706	+20%	10%
G. E. 50996	+20%	10%
1/5 to std. pkg.:		
Benjamin No. 903	20%	20%
Hubbell No. 5406	10%	20%
Bryant No. 706	Net	20%
G. E. 50996	Net	20%
Std. pkg.:		
Benjamin No. 903	44%	34%
Hubbell No. 5406	34%	34%
Bryant No. 706	30%	34%
G. E. 50996	30%	34%

BATTERIES, DRY

Each Net	No. 6 Regular Chicago	N. Y.	No. 6 Ignitor Chicago	N. Y.
Less than 12	$0.35	$0.35	$0.35	$0.35
12 to 50	.30	.30½	.30	.30½
50 to barrel	.26¼	.26	.27¼	.27
Barrel lots	.24¾	.24½	.24¾	.25

CONDUIT, METALLIC FLEXIBLE

Size, In.	Feet per Coil	List per 100 Ft. Chicago	N. Y.
5/16	250	$5.00	$5.00
⅜	250	7.50	7.50
½	100	10.00	10.00
¾	50	13.00	13.00
1	50	21.00	21.00
1¼	50	26.00	26.00
1½	25-50	35.00	35.00
2	25-50	45.00	45.00
2½	25-50	52.00	52.00

CONDUIT, METALLIC FLEXIBLE—CONTINUED

	⅜" Single Strip Chicago	N. Y.	⅜" Double Strip Chicago	N. Y.
Less than coil per 1000 ft., net	$71.25	$67.50	$75.00	$67.50
Cost to 1000 ft. per 1000 ft., net	60.00	60.00	67.50	60.00

	½" Single Strip Chicago	N. Y.	½" Double Strip Chicago	N. Y.
Less than coil per 1000 ft., net	$95.00	$90.00	$100.00	$90.00
Cost to 1000 ft. per 1000 ft., net	80.00	80.00	90.00	80.00

CONDUIT, NON-METALLIC FLEXIBLE

Size, in.	List, per Foot Chicago	N. Y.	Size, in.	List, per Foot Chicago	N. Y.
7/32	$0.05½	$0.05½	1	$0.25	$0.25
¼	.06	.06	1¼	.33	.33
⅜	.09	.09	1½	.40	.40
½	.12	.12	1¾	.47	.47
⅝	.15	.15	2	.55	.55
¾	.18	.18	2¼	.65	.65

Per 1000 Ft. Net.	7/32 In. Chicago	N. Y.	¼ In. Chicago	N. Y.
Less than $15.00 list	$36.67	$38.50	$40.00	$42.00
$15.00 to $60.00 list	27.50	25.85	30 00	28.20
$60.00 to $150.00 list	24.75	20.57	27.00	22.44

CONDUIT, RIGID IRON

(*Card No.* 38)

Size, in.	List, per Foot Chicago	N. Y.
¼	$0.08½	$0.08½
⅜	.08½	.08½
½	.08½	.08½
¾	.11½	.11½
1	.17	.17
1¼	.23	.23
1½	.27½	.27½
2	.37	.37
2½	.58½	.58½
3	.76½	.76½

COUPLINGS AND ELBOWS

(*Card No.* 37)

Size, in.	Couplings, List, Each Chicago	N. Y.	Elbows, List, Each Chicago	N. Y.
¼	$0.05	$0.05	$0.19	$0.19
⅜	.06	.06	.19	.19
½	.07	.07	.19	.19
¾	.10	.10	.25	.25
1	.13	.13	.37	.37
1¼	.17	.17	.45	.45
1½	.21	.21	.60	.60
2	.28	.28	1.10	1.10
2½	.40	.40	1.80	1.80
3	.60	.60	4.80	4.80

	Discount, ¼ In. to ½ In. Chicago	N. Y.	Discount, ¾ In to 3 In. Chicago	N. Y.
Less than 2500 lb	3.8%	13%	6.8%	15%
2500 to 5000 lb	5.8%	13%	8.8%	15%

(For galvanized deduct six points from above discounts.)

FLATIRONS

	Chicago.	N. Y.
List	$4.50	$5.00
Discount	25%	30%

FUSES, INCLOSED

250-Volt	Std. Pkg.	List Chicago	N. Y.
3-amp. to 30-amp	100	$0.25	$0.25
35-amp. to 60-amp	100	.35	.35
65-amp. to 100-amp	50	.90	.90
110-amp. to 200-amp	25	2.00	2.00
225-amp. to 400-amp	25	3.60	3.60
450-amp. to 600-amp	10	5.50	5.50
600-Volt			
3-amp. to 30-amp	100	$0.40	$0.40
35-amp. to 60-amp	100	.60	.60
65-amp. to 100-amp	50	1.50	1.50
110-amp. to 200-amp	25	2.50	2.50
225-amp. to 400-amp	25	5.50	5.50
450-amp. to 600-amp	10	8.00	8.00

FUSES, INCLOSED—CONTINUED

Discount	Chicago	N. Y.
Less than 1/5 std. pkg.	28%	28%
1/5 to std. pkg.	38%	38%

FUSE PLUGS

3-Amp. to 30-Amp.

Per 100 Net	Chicago	N. Y.
Less than 1/5 std. pkg	$6.25	$5.00
1/5 to std. pkg.	5.25	4.50

Standard package, 500. List, $0.07.

LAMPS, MAZDA

105 to 125 Volts

Regular, clear:	Std. Pkg.	List, Each—Chicago	List, Each—N. Y.
10 to 40-watt—B	100	$0.27	$0.27
60-watt—B	100	.36	.36
100-watt—B	24	.65	.65
75-watt—C	50	.65	.65
100-watt—C	24	1.00	1.00
200-watt—C	24	2.00	2.00
300-watt—C	24	3.00	3.00
Round bulbs, 3½-in., frosted:			
15-watt—G 25	50	.50	.50
25-watt—G 25	50	.50	.50
40-watt—G 25	50	.50	.50
Round bulbs, 3¾-in., frosted:			
60-watt—G 30	24	.72	.72
Round bulbs, 4⅜-in., frosted:			
100-watt—G 35	24	1.05	1.05

	Discount—Chicago	Discount—N. Y.
Less than std. pkg	Net list	List
Std. pkg	10%	10%

LAMP CORD

Cotton-Covered, Type C, No. 18

	Per 1000 Ft. Net—Chicago	Per 1000 Ft. Net—N. Y.
Less than coil (250 ft.)	$38.16	$35.77
Coil to 1000 ft.	28.62	27.18

LAMP GUARDS, WIRE

Per 100 Net	Chicago	N. Y.
Less than 50, Matthews 16-cp	$20.00	$20.00
Less than 1/5 std. pkg. Hubbell	28.35	29.00
Less than 36, 60-watt Loxon	25.00	25.00

OUTLET BOXES

Union Cat. No.	Black, List, per 100—Chicago	Black, List, per 100—N. Y.
101	$30.00	$30.00
102	30.00	30.00
103	25.00	25.00
106	20.00	20.00

Union Cat. No.	Galv., List, per 100—Chicago	Galv., List, per 100—N. Y.
101	$30.00	$30.00
102	30.00	30.00
103	25.00	25.00
106	20.00	20.00

Discount	Black—Chicago	Black—N. Y.	Galvanized—Chicago	Galvanized—N. Y.
Less than $10.00 list	40%	40%	35%	35%
$10.00 to $50.00 list	50%	48%	45%	44%

PIPE FITTINGS

Conduits, V.V., Unilets and Similar

Discount	Chicago	N. Y.
Less than 1/5 std. pkg.	25%	25%
1/5 to std. pkg.	32%	32%
Std. pgk.	40%	40%

PORCELAIN CLEATS—UNGLAZED

2 and 3 Wire

	Per 1000 Net—Chicago	Per 1000 Net—N. Y.
Less than 1/5 std. pkg.	$14.00	$15.80
1/5 to std. pgk.	13.00	14.80

Standard package, 2200. List per 1000, $20.

PORCELAIN KNOBS

Per 1000 Net	5½ N.C.—Solid Std. Pkg. 3500 Chicago	5½ N.C.—Solid Std. Pkg. 3500 N. Y.	Nail-it—N.C. Std. Pkg. 4000 Chicago	Nail-it—N.C. Std. Pkg. 4000 N. Y.
Less than 1/5 std. pgk.	$10.50	$11.25	$28.00	$18.00
1/5 to std. pkg.	9.75	9.00	21.50	15.00

SOCKETS AND RECEPTACLES

	Std. Pk.	List—Chicago	List—N. Y.
⅛-in. cap key socket	500	$0.33	$0.33
⅛-in. cap keyless socket	500	.30	.30
⅛-in. cap pull socket	250	.60	.60

Discount	Chicago	N. Y.
Less than 1/5 std. pkg.	List	List
1/5 to std. pkg.	15%	15%

SWITCHES, KNIFE

250-Volt, Front Connections, No Fuse

Perkins or Trumbull Type A:	List—Chicago	List—N. Y.
30-amp. S. P. S. T.	$0.80	$0.80
60-amp. S. P. S. T.	1.20	1.20
100-amp. S. P. S. T.	2.25	2.25
200-amp. S. P. S. T.	3.48	3.48
300-amp. S. P. S. T.	5.34	5.34
30-amp. D. P. S. T.	1.20	1.20
60-amp. D. P. S. T.	1.78	1.78
100-amp. D. P. S. T.	3.38	3.38
200-amp. D. P. S. T.	5.20	5.20
300-amp. D. P. S. T.	8.00	8.00
30-amp. 3 P. S. T.	1.80	1.80
60-amp. 3 P. S. T.	2.68	2.68
100-amp. 3 P. S. T.	5.08	5.08
200-amp. 3 P. S. T.	7.80	7.80
300-amp. 3 P. S. T.	12.00	12.00
Perkins Type B or Trumbull Type C:		
30-amp. S. P. S. T.	0.42	0.42
60-amp. S. P. S. T.	0.74	0.74
100-amp. S. P. S. T.	1.50	1.50
200-amp. S. P. S. T.	2.70	2.70
30-amp. D. P. S. T.	0.68	0.68
60-amp. D. P. S. T.	1.22	1.22
100-amp. D. P. S. T.	2.50	2.50
200-amp. D. P. S. T.	4.50	4.50
30-amp. 3 P. S. T.	1.02	1.02
60-amp. 3 P. S. T.	1.84	1.84
100-amp. 3 P. S. T.	3.76	3.76
200-amp. 3 P. S. T.	6.76	6.76

DISCOUNT

Type A, Perkins or Trumbull:	Chicago	N. Y.
Less than $10 list	List	List
$10 to $25 list	15%	15%
$25 to $50 list	18%	18%
Type B, Perkins, or Type C, Trumbull:		
Less than $10 list	10%	10%
$10 to $25 list	20%	20%
$25 to $50 list	28%	28%

SWITCHES, SNAP AND FLUSH

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List—Chicago	List—N. Y.
5-amp. single-pole	250	$0.28	$0.28
5-amp. single-pole, ind.	250	.32	.32
10-amp. single-pole	100	.48	.48
10-amp. single-pole, ind.	100	.54	.54
5-amp., three-point	100	.56	.56
10-amp., three-point	50	.76	.76
10-amp., 250-volt, D. P.	100	.66	.66

10-Amp., 250-Volt Push-Button Switches

	Std. Pkg.	List—Chicago	List—N. Y.
10-amp. single-pole	100	$0.45	$0.45
10-amp. three-way	50	.70	.70
10-amp. double-pole	50	.70	.70

Discount	Chicago	N. Y.
Less than 1/5 std. pkg.	Net	List
1/5 to std. pkg.	15%	15%
Std. pkg.	30%	28%

SWITCH BOXES, SECTIONAL CONDUIT

C. F. Mfg. Co.	List, Each—Chicago	List, Each—N. Y.
No. 155	$0.34	$0.34
No. 160	0.60	0.60

Discount	Black—Chicago	Black—N. Y.	Galvanized—Chicago	Galvanized—N. Y.
Less than $2.00 list	40%	40%	30%	30%
$2.00 to $10.00 list	50%	50%	40%	40%
$10.00 to $50.00 list	64%	60%	52%	52%

TOASTERS, UPRIGHT

	Chicago	N. Y.
List	$4.50	$4.50
Discount	25%	25%

WIRE, ANNUNCIATOR

Per Lb. Net	Chicago	N. Y.
No. 18, less than full spools	$0.65	$0.47
No. 18, full spools	0.55	0.45

WIRE, RUBBER-COVERED, N. C.

Solid-Conductor, Single-Braid

	Price per 1000 Ft. Net—Less than 500 Ft. Chicago	Less than 500 Ft. N. Y.	500 to 1000 Ft. Chicago	500 to 1000 Ft. N. Y.	1000 to 5000 Ft. Chicago	1000 to 5000 Ft. N. Y.
No.						
14	$18.00	$18.00	$16.00	$14.50	$14.00	$12.50
12	27.05	29.71	22.85	25.30	20.95	18.60
10	38.20	41.16	32.00	35.28	29.60	25.87
8	46.20	59.64	42.35	43.12	37.20	46.28
—	72.70	94.71	66.65	81.18	59.40	59.53

WIRE, WEATHER-PROOF

Solid-Conductor, Triple-Braid, Sizes 4/0 to 8, Inc.

	Per 100 Lb. Net—Chicago	Per 100 Lb. Net—N. Y.
Less than 25 lb.	$44.50	$43.25
25 to 50 lb.	43.50	42.25
50 to 100 lb.	42.50	41.25

NEW APPARATUS AND APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Floodlight Projector

Projectors for floodlighting purposes for use with 400-watt Mazda lamps with mogul bases have been developed by the Wheeler Reflector Company of Boston. These projectors may also be used with 200-watt lamps and medium-base adapters. They are mounted on a

PROJECTOR FOR FLOODLIGHTING PURPOSES

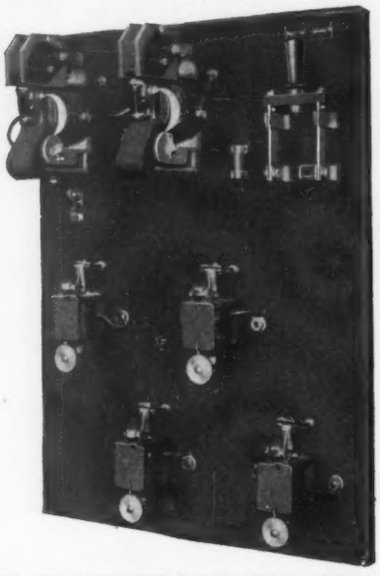
swivel and trunnion standard for convenient adjustment. The reflector is nickel-plated copper. When used with the standard 400-watt floodlighting Mazda lamp, with its concentrated filament at the focal point of the reflector, a beam of light is obtained of approximately 170,000 cp. opposite the center, with all light concentrated within a zone of 10 deg. A wider distribution of light can be obtained by setting the filament slightly in front or back of the focal point. This adjustment, however, must be kept within certain limits or a dark spot will appear in the center of the field of illumination which becomes darker as the filament is moved further out of the focal position.

Crane Protective Panels

Crane protective panels of the type shown herewith are being manufactured by the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa. These panels protect crane motors operated by drum or grindstone controllers against injury due to overloads, grounds, short circuits, sudden return of power after failure of voltage, and the improper operation of the controller, and prevent the premature starting of the motors.

The panels are furnished for one to six circuits, depending upon the number of motors to be protected. On each panel are mounted two single-pole magnetic contactors, an electrical interlock for each contactor, two to seven automatic reset overload relays, and a double-pole, single-throw knife switch, together with the necessary inclosed fuses. When desired an inclosing cover is furnished, making the panel dust-proof.

The magnetic contactors are operated from a push-button station mounted in the crane cab. Owing to the electrical interlocks the contactors will not close until the starting push-button is pressed, and after closing they will not open when the push-button is released unless the contactor coil becomes de-energized by the operation of the overload relays or by the opening of the main switch. Should the current in any circuit rise to a value corresponding to the setting of the relay in that circuit, the relay opens the control circuit through the shunt-operating coils of the magnetic contactors, which then open the main circuit.

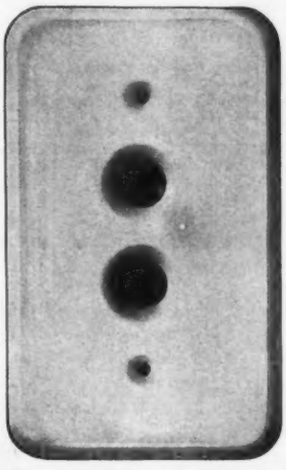


CRANE PROTECTIVE PANEL THAT SERVES A TWOFOLD PURPOSE

When only one circuit is to be protected an overload relay is placed in each side of the line. When more than one circuit is to be protected an individual relay is placed in one side of the line of each circuit and a cumulative relay in the common side of the main circuit. Each individual relay is set to operate at the overload current value of its own circuit, while the cumulative relay is set for the integrated current value of the total load. Both sides of the line are thus protected by overload relays, and failure of the relays to operate because of grounded wires is made impossible.

Switch Plates

Porcelain-enamel switch plates which will harmonize with wall decorations are offered to the trade by the Lumi-

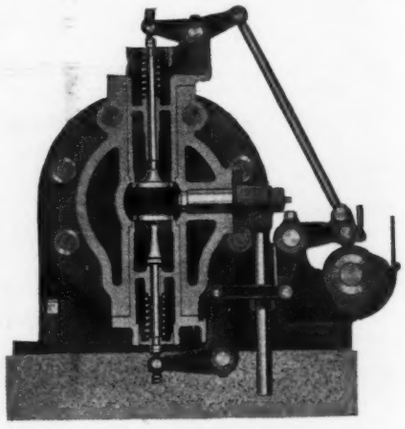


PORCELAIN-ENAMEL SWITCH PLATE

nous Unit Company, 2615 Washington Avenue, St. Louis. These switch plates are furnished in single, two-gang and three-gang types. The manufacturer calls attention to the fact that these switches are sanitary, practical and permanent.

Oil Engine

Horizontal high-compression oil engines like the one shown herewith are being built by McEwen Brothers of Wellsville, N. Y., in single or multiple units rated at 65 hp. per cylinder and up. Starting the engine is simple, it is said, as air at only 120 lb. pressure



HIGH-COMPRESSION OIL ENGINE

per square inch (84360 kg. per sq. m.) is necessary for this purpose. The dismantling of the cylinder head may be done without disturbing the camshaft bearings or valve-actuating levers. The

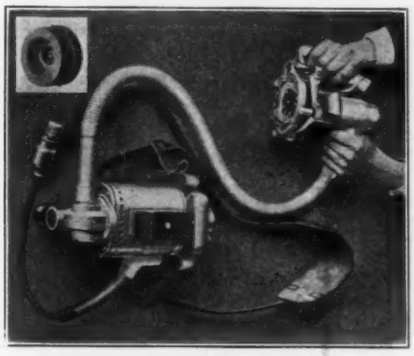
fuel pump and levers are mounted in such a manner that the cam thrust is taken up directly by the engine foundation, thus relieving the main frame of unnecessary stresses from this source. No high-compression stuffing boxes are used on the fuel pump and fuel-injection valve, case-hardened and ground sleeves being sufficient.

The air suction port and channel communicating with the air suction valve is cast integral with the main frame. The cylinder liner, which is made of hard close-grained cast iron, is pressed into the frame. It is free to expand longitudinally so that heat stresses therein are not transmitted to the frame. To prevent leakage between the cylinder head and the liner a packed tongue-and-groove joint is provided.

The piston has a cone-shaped top which is highly polished in order to reflect the heat. Six rectangular piston rings having narrow wearing surfaces are employed. The compressor furnishing the fuel injection air has two stages and is large enough to charge the tanks while the engine is running. The low-pressure valves, each in a separate cage, and the high-pressure valves, which are combined, are mounted vertically and so arranged that they may be easily removed for inspection. The output of the compressor is controlled by a throttling device on the suction side. No stuffing box is used in the fuel-valve body, a long case-hardened and ground sleeve being used instead. The latter also serves as a guide for the valve stem. The speed of the engine is regulated by varying the amount of oil supplied to the fuel nozzle. This is accomplished by varying the stroke of the fuel pump through the medium of a wedge operated by the governor. The fuel pump, which is mounted on the camshaft bearing case close to the governor, is operated by a cam. The plunger is provided with a spring return.

Concrete Surfacer

The rotary concrete surfacer shown herewith comprises a cutting tool driven through a flexible shaft by an electric motor carried by the operator.



ROTARY CONCRETE SURFACER

The driving motor is of the universal type. The cutting tool consists essentially of a disk, on which are mounted sixteen hardened-steel cutter wheels. The cutter wheels roll on the surface to be dressed in such a manner that their teeth remove the material by a chipping action. The machine is equipped with ball bearings throughout and is lubricated by one grease cup, which feeds the lubricant for the entire tool through the flexible-shaft casing. A special stone and grinding attachment is included with the standard equipment. The attachment is interchangeable with the cutting tool and is used for grinding in a mixture of cement and sand which is swabbed on the surface after the board marks and projections have been thoroughly removed by the cutting tool. This device is made by the Elevator Supplies Company, Inc., of New York City.

Electric Ranges

Attention is called by the Estate Stove Company of Hamilton, Ohio, to a number of changes recently made in its electric ranges. A triple cartridge

RANGE WITH GUTTER TO CATCH CONDENSED WATER

fuse block, mounted in a heavy sheet-iron box with hinged drop doors, is being installed under the end shelf. To catch condensed water a gutter has been provided immediately under the oven-door opening, thus preventing water running down the front. This arrangement is necessary, as considerable moisture is condensed for a short time after the energy has first been turned on for heating the oven. All terminals exposed to high temperature are made of monel metal. An improved type of oven-door latch is used, which compensates for any wear on the latch and enables the door to be held firmly closed to prevent loss of heat.

Hair-Drying Comb

An electrically heated hair-drying comb, the entire metal part of which is made of a single die casting, has recently been placed on the market. This construction permits using a flat heating element and eliminates the necessity of enlarging the back of the comb. The 30-watt heating element can be placed near the teeth of the comb, which makes for greater efficiency of heat application. The comb has an ebonized handle and 6 ft. (1.83 m.) of unbreakable cord. This device is made by the Russell Electric Company of Chicago, Ill.

Telephone Accessory

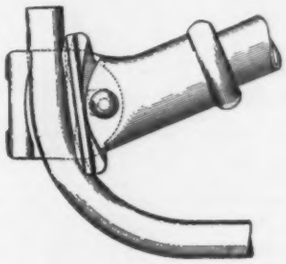
In the accompanying illustration is shown a telephone accessory having ear-tips that keep disturbing noises out of the ears while telephoning, especially

ACCESSORY FOR LONG-DISTANCE TELEPHONING

on long-distance calls. Another feature pointed out by the manufacturer is that the instrument leaves both hands free while telephoning. The device is not an attachment; therefore its use cannot be prohibited by telephone companies. To use the device the receiver is placed on the sound chamber and the ear tips inserted in the ears of the user. Adjustable branch hearing tubes are provided which may be bent so the tension between the ear-tips can be adjusted to suit the individual user. Spring wires are placed inside the branch tubes. Weilaphone, Inc., Metropolitan Tower, New York City, is the maker of this device.

Pipe Hickey

An automatic grip pipe hickey with one fixed and one automatically movable jaw is shown in the accompanying illustration. The movable jaw, it is said, utilizes for clamping all the force required to bend the pipe. The jaws are set at an angle to the handle socket and are similar at each end, thus permitting the bending of pipe from either side. The movable jaw has a bearing of 2¼ in. (5.7 cm.) in diameter, no strain coming on the pin, which serves only to prevent the jaw from falling out. This device is offered to the trade by the Fey Specialty Company of Detroit, Mich.



PIPE-BENDING TOOL.

Trade Publications

CEMENT.—The Edw. E. Early Company of Canton, Ohio, is distributing a leaflet descriptive of its commutator cement.

MOTORS.—The Burke Electric Company of Erie, Pa., is distributing a leaflet descriptive of its alternating-current machinery.

RADIATORS.—The Pelouze Manufacturing Company of Chicago has issued a leaflet descriptive of its electric radiator for bathrooms.

SWITCH PLATES.—The St. Louis Brass Manufacturing Company of St. Louis is distributing a leaflet descriptive of its porcelain-enameled switch plates.

PYROMETERS.—The Brown Instrument Company of Philadelphia has prepared bulletin No. 19, descriptive of its Automatic Temperature Control Pyrometer.

WASHING MACHINES.—The Laun-Dry-Ette is illustrated and described in a booklet now being distributed by the Home Specialty Company of Cleveland, Ohio.

MOTORS.—Direct-current motors and generators for 115, 230 and 550 volts are described in bulletin 174, issued by the Crocker-Wheeler Company of Ampere, N. J.

WELDING APPARATUS.—The Bradford-Ackerman Corporation of New York City has issued bulletin 101, descriptive of Astra oxy-illuminating gas apparatus for lead burning.

TESTING SETS.—The Queen-Gray Company of Philadelphia is distributing bulletin E-6, descriptive of portable testing sets and instruments for the maintenance of lines and cables.

PROJECTORS.—Imperial floodlight projectors for protection, business and pleasure are described and illustrated in the folder now being mailed by the Crouse-Hinds Company of Syracuse, N. Y.

PORTABLE LAMP.—The Uno-Lite Company of America has issued a booklet entitled "Loading Your Lines." The booklet tells the story of the development and possible application of the Uno-Lite reading lamp.

TELEPHONE ACCESSORY. — Weilaphone, Inc., 1 Madison Avenue, New York City, has prepared an illustrated leaflet descriptive of its Weilaphone device used to increase the hearing efficiency of the telephone.

KITCHENETTE.—The National Electric Utilities Corporation, 103 Park Avenue, New York City, is distributing a leaflet descriptive of its electric kitchenette. This is a combination range for roasting, broiling, baking, toasting, boiling, etc.

INDUCTION MOTORS.—The Crocker-Wheeler Company of Ampere, N. J., has prepared bulletin 173, describing slot-bridge construction for induction motors. Open slot, semi-closed slot and magnetic slot bridge methods are described and illustrated.

POTENTIOMETERS. — Potentiometers for the measurement of "hot spots" in the electrical apparatus are described in leaflet 1324, now being distributed by the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa. The principle involved is that of thermo-electric couple.

REFLECTORS.—The National X-Ray Reflector Company is distributing its April issue of Eye Comfort, published to aid advocates of good lighting. This issue includes articles on war times and floodlighting, a description of a new projector, how to floodlight the flag, eye efficiency and indirect lighting.

LAMPS.—The Cooper Hewitt Electric Company of Hoboken, N. J., is distributing an illustrated calendar in which photographs are shown of actual installations of Cooper Hewitt lamps. These installations include machine shops, cotton mills, engraving plants, motion picture studios, automobile factories, etc.

MOTORS.—Medium-sized direct-current motors and generators for general use are illustrated and described in bulletin 173, now being distributed by the Crocker-Wheeler Company of Ampere, N. J. This company has also issued bulletin No. 176, descriptive of its form R induction motor. This motor is for two-phase and three-phase, squirrel-cage type and 25-cycle.

MOTORS AND GENERATORS. — The Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa., has prepared catalog No. 38, descriptive of small motors and generators. This catalog contains information on alternating-current single-phase and polyphase motors, direct-current motors, fans and blowers, sewing-machine motors, generators, buffing motors, etc.

ELECTRICAL SPECIALTIES AND REFLECTORS.—Harvey Hubbell, Inc., of Bridgeport, Conn., has prepared catalog No. 16, which introduces an absolutely new idea in the listing of electrical specialties and reflectors. Working on the theory that the prospective buyer is anxious to see either a sample or an actual illustration of the device he wishes to purchase, this company has arranged in chart form all sockets, pull switches, attachment plugs, receptacles and reflectors. This chart demonstrates clearly the interchangeability of the various lines by illustrating at the side and top the component parts and at the point where the imaginary lines drawn from the component parts converge the assembled parts.

Trade Notes

THE OKONITE COMPANY, New York City, has moved its offices to the seventh floor of the Astor Trust Building, 501 Fifth Avenue.

THE WESTERN ELECTRIC COMPANY has filed notice at Trenton, N. J., of increase in its capital from $15,750,000 to $30,750,000.

THE MACBETH-EVANS GLASS COMPANY, Pittsburgh, Pa., announces that its general offices are to be in the new Chamber of Commerce Building, occupying the fourteenth floor.

THE ELECTRIC STORAGE BATTERY COMPANY, Nineteenth Street and Allegheny Avenue, Philadelphia, Pa., will build a one-story addition, 40 ft. by 75 ft., to cost $10,000. Contract for erection has been awarded.

THE BURKE ELECTRIC COMPANY of Erie, Pa., has opened a Washington branch sales office in charge of J. N. Perry at 424 Union Trust Building exclusively for United States government service during the war.

THE IMPERIAL PORCELAIN COMPANY, manufacturer of electrical porcelain specialties, Trenton, N. J., is considering the erection of a new plant near Asbury Park, to cost about $25,000. The proposed factory will be about 40 ft. by 250 ft.

FRED W. L. FULLERTON will incorporate his firm under the name F. W. L. Fullerton, Inc., and will open at 17 East Forty-second Street, New York City, a distributing business for lamps, fans and power motors, electric lighting fixtures, vacuum cleaners and power-consuming devices.

THE S K F BALL BEARING COMPANY OF CALIFORNIA, INC., has been organized in order to supply more readily the rapidly increasing demand for S K F ball bearings on the Pacific Coast. The main office of this company, under the direction of A. M. MacLaren, has opened in San Francisco at 341 Larkin Street, and at this office a large and assorted stock of bearings will be carried.

THE JOHN C. STOLPH COMPANY, Newark, N. J., manufacturer of insulating and protective varnishes, announces the completion of its Newark plant, which includes two executive offices, a new and large insulating laboratory and additions and improvements in the factory which will double its capacity. The company also announces that the Dolph Manufacturing Corporation, 39 Cortlandt Street, New York City, has been appointed general sales representative of the company, and all sales will be handled through it hereafter.

THE RATHBONE-SARD ELECTRIC COMPANY, INC., Albany, N. Y., opened its new factory for the manufacture of Acorn electric ranges on Monday, April 30. The Rathbone-Sard Company has been in the stove business for eighty-seven years, making coal stoves for cooking in the early days and then branching into the gas-stove business. Now, with the incorporation of a new branch company, the Rathbone-Sard Electric Company, Inc., the old concern takes the next step in the development of appliances for cooking. The new plant is a modern structure, 50 ft. by 200 ft. and three stories high. In this plant the range frames and ovens will be built and assembled with the electric heating units which are made at the Pittsfield Works of the General Electric Company. The building was opened with a dinner given by the officers of the new company to members of the executive staff of the Rathbone-Sard Company and the General Electric Company.

New Incorporations

THE APEX ELECTRICAL DISTRIBUTING COMPANY of Cleveland, Ohio, has been chartered with a capital stock of $25,000 by W. T. Holliday and others.

THE OLIVER-WALSTRUM ARMATURE WORKS of Birmingham, Ala., has been incorporated with a capital stock of $12,000 by S. W. Oliver, A. H. Walstrum and H. F. Walstrum.

THE GENERAL STORAGE BATTERY & REPAIR COMPANY, 1737 Boulevard, Jersey City, N. J., has been organized by Fred A. Hoefield and Edward J. Schullian to operate a local plant.

THE ELECTRIC SUPPLY & EQUIPMENT COMPANY of Charlotte, N. C., has been incorporated with a capital stock of $450,000 ($10,000 subscribed) by W. H. Martin, Jr., T. G. Lane and others.

THE WESTERN COIL & ELECTRICAL COMPANY of Racine, Wis., has been incorporated by James V. Rohan, William Mitchell Lewis and James W. Gilson. The company is capitalized at $30,000.

THE GENERAL LIGHTING & SUPPLY COMPANY of St. Louis, Mo., has been incorporated with a capital stock of $5,000 to deal in electrical supplies. The incorporators are: Michael M. Cohen, Jacob D. Cohen and Joseph Cohen.

THE FLASHLIGHT SIGNAL COMPANY of Philadelphia, Pa., has been incorporated by George C. Taggert, Pitco Rankin and Howels Kirk, all of Philadelphia, Pa. The company is capitalized at $50,000 and proposes to manufacture signal devices.

THE NO BATTERY LIGHT COMPANY of Brooklyn, N. Y., has been incorporated with a capital stock of $30,000 to manufacture no-battery flashlights. The incorporators are: Albert Lazarowitz, M. Camora and Jacob Helperen of Brooklyn, N. Y.

THE LESHER ELECTRICAL COMPANY of Dayton, Ohio, has been incorporated with a capital stock of $5,000 to deal in electrical supplies. The company will make a specialty of electric wiring and general electrical work. Chester Lesher is manager.

THE AUTOMATIC CONTROLLER CORPORATION of New York, N. Y., has been incorporated by G. G. Tusa, Thorne Foster, of Brooklyn, N. Y., and F. L. Harris of Elmhurst, N. Y. The company is capitalized at $10,000 and proposes to deal in electrical apparatus.

HATHEWAY & KNOTT of New York, N. Y., have filed articles of incorporation with a capital stock of $10,000 to do a general electrical contracting business. The incorporators are: G. C. Knott, G. L. Hatheway and J. A. Byrne, 120 Liberty Street, New York, N. Y.

THE ROCK PRODUCTS EQUIPMENT CORPORATION of New York, N. Y., has been incorporated with a capital stock of $10,000 to manufacture machinery, engines, dynamos, etc. The incorporators are: H. F. Holly, H. F. Gerdes and N. E. Betjeman, 56 Liberty Street, New York, N. Y.

MITCHELL & GRENELEE of Tuckahoe, N. Y., have filed articles of incorporation with a capital stock of $100,000 to manufacture metals, chemicals, insulation devices, etc. The incorporators are: A. M. Mitchell, 2d, Tuckahoe; J. H. Grenelle, A. N. Grenelle, 163 Lefferts Place, Brooklyn, N. Y.

HENRY A. KRIES & SONS & COMPANY, 6 West Lombard Street, Baltimore, Md., have been incorporated with a capital stock of $50,000 to manufacture heating, electric and ventilating apparatus, etc. The incorporators are: Henry A. Kries, Henry A. Kries, Jr., and Clarence A. Kries.

THE ACME STORAGE BATTERY CORPORATION of Highland, N. Y., has been incorporated by J. Phillips, F. F. Simpson and G. Kaehler, 246 West Fifty-second Street, New York, N. Y. The company is capitalized at $100,000 and proposes to manufacture and deal in storage batteries for automobiles.

THE ELECTRO METALLURGICAL SALES CORPORATION of Niagara Falls, N. Y., has been incorporated by E. P. Price, F. E. Lawton and G. C. Furness, 308 West Seventy-ninth Street, Niagara Falls. Active capital $500,000. The company proposes to deal in iron, steel, metallurgical and chemical products.

THE NATIONAL CONDUIT & CABLE COMPANY of Hastings-on-Hudson, N. Y., has been incorporated by Percy S. Williams, 539 Seventy-third Street, Brooklyn; J. W. Rhoades and Thomas M. Malone of Brooklyn, N. Y. The company is capitalized at $8,750,000 and proposes to manufacture wires, cables, electrical conductors, electrical railway, subway and conduit equipment.

New England States

OQUOSSOC, ME.—The Oquossoc Light & Power Company has been granted permission by the Public Utilities Commission to issue $10,000 in capital stock, part of the proceeds to be used for extensions.

SOUTH BERWICK, ME.—The Public Utilities Commission has authorized the Berwick & Salmon Falls Electric Company to issue $61,500 in bonds and $4,600 in capital stock, the proceeds to be used for the purchase of the water power, partly developed, now owned by the Berwick Realty Corporation, formerly part of the property of the White Mountain Paper Company.

RUTLAND, VT.—The Hortonia Light & Power Company has petitioned the Public Service Commission for permission to increase its capital stock from $150,000 to $500,000, the proceeds to be used in connection with projects already under way in Salisbury, just below the outlet of Lake Dunmore, and two others on Otter Creek, between Rutland and Vergennes.

BOSTON, MASS.—The State Gas and Electric Light Commission has granted the Eastern Massachusetts Electric Company permission to lay transmission lines through the town of Saugus for the purpose of connecting the plant of the Salem Electric Light Company with the Malden & Melrose Gas Company's plant and that of the Suburban Gas & Electric Light Company of Revere.

BOSTON, MASS.—Bids will be received by the Schoolhouse Commissioners of the city of Boston until May 18 for the erection of an addition to the William Lloyd Garrison Elementary School, George Putnam District, Hutchings and Brookledge streets, Roxbury, Boston. A deposit of $25 will be required for a complete set of plans and specifications, and one of $15 for a set of heating and ventilating or electrical plans with specifications.

BOSTON, MASS.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until May 21 for furnishing and installing weighing hoppers and trolleys, motor-driven bridges, coal valves, supporting steel work and electrical equipment in the central power plant, navy yard, Boston, Mass. Drawings and specifications (No. 2372) can be obtained upon application to the above bureau or the commandant of the navy yard named.

FALL RIVER, MASS.—The Massachusetts Waterways Commission has refused to allow the Fall River Electric Light Company to erect wires across the Taunton River, but the company may make application for another location under the power of eminent domain in a new law which goes into effect about May 1.

SPRINGFIELD, MASS.—The Turners Falls (Mass.) Power & Electric Company has awarded the general contract for its large power plant to be erected at Chicopee Junction on the Chicopee River to the Fred T. Ley Company of Springfield. The main building will be about 350 ft. x 250 ft., of reinforced concrete and brick construction, and will cost about $1,500,000. The initial installation will provide for 40,000 kw. The plans provide for an ultimate capacity of 120,000 kw.

NEW HAVEN, CONN.—The United Illuminating Company, it is reported, is contemplating extending its electrical service to the town of Trumbull.

Middle Atlantic States

BROOKLYN, N. Y.—The W. B. Perry Electric Company, 286 Livingston Street, Brooklyn, N. Y., is reported to be in the market for a two-phase, 60-cycle, 220-volt alternating current motor-generator set and a 125-kw. to 150-kw., direct current, 125-volt generator.

PARISHVILLE, N. Y.—The Public Service Commission has approved the purchase of the Parishville electric plant by Myron E. Robson from the A. Sherman Lumber Company.

POUGHKEEPSIE, N. Y.—The capital stock of the Poughkeepsie & Wappingers Falls Electric Railway Company has been increased from $750,000 to $1,000,000.

ROCHESTER, N. Y.—Bids will soon be asked for equipment of the new power house at the main sewage-disposal plant in Irondequoit. The plant will have a generating capacity of 150 hp.

STAPLETON, N. Y.—Bids will be received at the Supervising Chief Engineer's office, Room 730 Custom House, New York, N. Y., until May 24 for remodeling roads and walks, changing main entrance to grounds, providing conduit for electric ground lighting, etc., at the United States Marine Hospital at Stapleton. Specifications may be obtained at the above office.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

ALLOWAY, N. J.—The citizens have voted to install an electric-lighting system in Alloway. Energy will be supplied from the Salem plant of the Electric Company of New Jersey.

CLINTON, N. J.—An electric light plant is being erected in Clinton. The plant when completed will supply electrical service in Stewartsville.

DOVER, N. J.—The New Jersey Power & Light Company has discontinued its Boonton plant and transferred the entire load to the new turbo-generating station at Dover. Transformer equipment, consisting of three 500-kw., 33,000-volt units, taken from the Boonton station, is being installed. Work has begun on the erection of a new transmission line from Landing, near Lake Hopatcong, to Netcong-Stanhope, for local light and power service.

NEWARK, N. J.—The power plant and boiler house of the Hewitt Steel Corporation, Chapel Street, Newark, was destroyed by fire on April 28, causing a loss of about $10,000. The plant, it is understood, will be rebuilt.

NEWARK, N. J.—The McGann Warehouse Company, 100 Front Street, Newark, is planning to install a repair department and electric battery charging plant in the garage to be established at 27 Lombardy Street by the company.

PATERSON, N. J.—The Board of Public Works has contracted with the Public Service Electric Company for extension of the lighting system on Main Street.

PATERSON, N. J.—The Board of Fire & Police Commissioners has authorized the installation of a new fire-alarm telegraph system at once. The Watson Electric Company, 88 Ellison Street, will have charge of the work.

TRENTON, N. J.—Preliminary surveys are under way, it is reported, by the Pennsylvania Railroad Company for equipping its lines from Trenton to Camden, and from Camden to Pemberton for electrical operation, using the overhead system.

WILDWOOD, N. J.—The City Commission is considering the installation of an electric floodlighting system on the beach front. The present lighting system along the boardwalk will be extended. William C. Hendee, director of highways, is in charge.

BEAVER FALLS, PA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until May 28 for changes in plumbing, gas piping, conduit and wiring and lighting fixtures in the United States post office at Beaver Falls. For details see proposal columns.

HAMBURG, PA.—An electric furnace will be installed at the new steel mill to be established by Daniel J. Driscoll and associates. The former plant of the Multiple Parts Company has been acquired and is being enlarged to accommodate the equipment.

HARRISBURG, PA.—Bids will be received by the Board of Commissioners of Public Grounds and Buildings, Harrisburg, until May 31 for supplies for the various departments as follows: Schedule D—engineering and laboratory supplies; Schedule J—plumbing and power plant supplies. Blank bond and schedules containing all necessary information may be obtained at the Department of Public Grounds and Buildings, Harrisburg.

HARRISBURG, PA.—The Public Service Commission has granted permission to the following companies to issue bonds for extensions and improvements: The United Lighting Company of Albion, $110,000; Scranton (Pa.) Electric Company, $183,000; Penn Central Light & Power Company of Altoona, $31,000; Allegheny County Steam Heating Company of Pittsburgh (stock), $220,000; Luzerne County Gas & Electric Company of Kingston, $270,000; West Penn Traction Company of Pittsburgh, $41,000, and Mercer County Light, Heat & Power Company of Greenville, $300,000.

PHILADELPHIA, PA.—The Philadelphia Electric Company has purchased a site, about 60 acres, on Petty's Island, in the Delaware River. As yet the company has made no announcement of its plans.

PHILADELPHIA, PA.—The McClintic-Marshall Company of Pittsburgh has been awarded the contract for erection of a new machine shop and electric power plant at the League Island Navy Yard, Philadelphia. The building will be 130 ft. x 325 ft.

PHILADELPHIA, PA.—The Philadelphia Electric Company has awarded the contract for the construction of its proposed new substation on Hunting Park Avenue to John R. Wiggins & Co., Otis Building, Philadelphia. The building will be of reinforced concrete, one story, 134 ft. x 135 ft.

SCRANTON, PA.—William E. Bright, receiver of the Scranton Textile Company, has been granted permission by the local court to equip the plant for electrical operation to replace the present steam power.

BALTIMORE, MD.—A new power plant will be erected by J. H. and L. A. Dockman, 32 East Montgomery Street, at their ice factory to be built at Rock Creek, for which plans are now being prepared.

BALTIMORE, MD.—In connection with the proposed improvements to be made by the Pennsylvania Railroad Company the City Council is negotiating with the company to equip its lines at the local freight terminal for electrical operation.

BLUEFIELD, W. VA.—Plans are being considered by the Appalachian Power Company for the construction of a steam-driven electric generating station on New River, between Virginian and Norfolk & Western Railways, to cost about $1,000,000. Equipment will include an 18,750-kw. turbine, three 12,000-hp. boilers, etc. Orders have been placed for turbine and boilers. As yet definite plans have not been decided upon.

BOWLING GREEN, VA.—The Bowling Green Light & Power Company, recently organized, it is reported, will erect a power station, 20 ft. x 40 ft., and install an oil engine; the cost of electric plant is estimated at $5,000; will also erect a transmission system (3 miles) at a cost of $5,000, to connect Bowling Green and Milford, Va. The company is capitalized at $10,000. L. E. Martin is president.

FRANKLIN, VA.—Improvements are contemplated to the municipal electric-light plant, involving an expenditure of about $10,000. It is proposed to change the system from direct to alternating current.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until May 21 for furnishing and installing 500 and 750-kw. turbo-generators and 2500, 3125, 3750 and 4375-kva. alternators for the various navy yards. Specifications (No. 2379) may be obtained on application to the bureau.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until May 21 for steam turbine-driven turbo and engine-driven reciprocating air compressors of capacities varying from 2500 to 8000 cu. ft. per minute. Specifications (No. 2380) can be obtained upon application to the above bureau.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until May 28 for constructing three 600-ft. steel towers with concrete footings at the United States Naval radio station, El Cayey, P. R. Plans and specifications (No. 2364) can be obtained upon application to the bureau or to the commandant of the navy yard, New York, N. Y.

WASHINGTON, D. C.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until May 24 for furnishing and installing lighting fixtures in the United States post office at Alliance, Neb.; Elkins, W. Va.; Huntington, Ind.; Kalispell, Mont.; Newark, Ohio; Orlando, Fla.; Pottstown, Pa.; Roseburg, Ore.; Rumford, Me.; South Bethlehem, Pa.; South Boston, Va., and Vancouver, Wash. For details see proposal columns.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations the following supplies: Puget Sound, Wash., Schedule 1074—miscellaneous cable chain; Schedule 1078—eight watertight, type B annunciators, 72 vibrating bells, 75 bush buttons, 50 salvo firing buzzers, 1000 interior fittings, 25 watertight telephone jacks, 1900 sockets for instruments, lamps, keyless, wall, key; 145 spools of silk insulating tape. Norfolk, Va., Schedule 1050—two Diesel engine-driven generating sets; Schedule 1072—miscellaneous sleeves, turnbuckles, sheaves. Brooklyn, N. Y., Schedule 1072—330 watertight vibrating bells, miscellaneous searchlight carbons, 2500 porcelain attachment plugs, 500 knife switches, 50,000 two-pole wire terminals. Mare Island, Cal., Schedule 1078—miscellaneous receptacle clusters, three masthead lenses, 1600 non-watertight attachment plugs, 180 fire control telephone plugs, 250 chain-pull commercial sockets, miscellaneous baby knife, switches, etc. Philadelphia, Pa., Schedule 1064—miscellaneous ventilating fans; Schedule 1068—800 and 200 brass sockets and switches. Boston, Mass., Schedule 1072—520 rolls white muslin tape. Boston, Mass., Philadelphia, Pa., Schedule 1072—400 lb. grade A1 un-

cut mica. Mare Island, Cal., and Puget Sound, Wash., Schedule 1078—4200 non-watertight portable guards. Philadelphia, Pa., and Norfolk, Va., Schedule 1091—two motor-driven spacing and plate tables with punches. Applications for proposal blanks should designate the schedule desired by number.

North Central States

CALUMET, MICH.—W. E. Smith, we are informed, is not interested in the installation of a new street-lighting system in Calumet, as reported in the issue of March 31. Mr. Smith is interested in the establishment of a lighthouse in this county.

HOLLY, MICH.—The village of Holly has accepted the proposal of the Consumers' Power Company to take over the local electric plant and supply electrical service here.

AKRON, OHIO.—The Coventry Land Company has petitioned the City Council to authorize the Northern Ohio Traction & Light Company to furnish electricity to the Firestone Park allotment. The land company states that it will install a lighting system, to cost from $22,000 to $25,000, if energy will be furnished.

BARBERTON, OHIO.—The installation of a new boiler and generating equipment, to cost $61,000 and $48,000 respectively, is under consideration by the lighting committee of the City Council.

CINCINNATI, OHIO.—The power house of the Coney Island Company at Coney Island, a river and amusement resort near Cincinnati, was damaged by fire on May 4, causing a loss of about $50,000. The company will secure electricity from the city lines for operating the lighting system and various amusement devices of the park for the present.

CINCINNATI, OHIO.—Plans for the construction of an ornamental street-lighting system in the business section of the city, to replace the arc lamps now in use, have been agreed upon by the City Council and the necessary ordinance will soon be passed, with a view of completing the work during the summer. The Council also contemplates similar improvements in the lighting system on some of the suburban streets. The service department is now preparing estimates of the cost.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, City Hall, Cleveland, until May 22 for furnishing an exciter unit for the division of light and heat. Specifications may be obtained upon application to the office of the division of light and heat, room 204, City Hall.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, City, Hall, Cleveland, until May 22 for furnishing economizers, forced and induced fans for the division of light and heat. Specifications may be obtained at the office of the division of light and heat, room 204, City Hall.

GREEN SPRING, OHIO.—The Village Council has authorized an issue of $6,500 in bonds for the purchase of the plant of the Green Spring Electric Light & Power Company to be owned and operated by the municipality.

HUNTSVILLE, OHIO.—At an election held recently the proposal to issue $2,500 in bonds for the installation of an electric-lighting system was carried.

KINGS MILLS, OHIO.—The Hamilton (Ohio) Electric Company has the contract for installing electric switchboards and other equipment in the plant of the Peters Cartridge Company at Kings Mills. The cost of the work is estimated at $25,000.

LORAIN, OHIO.—Work will soon begin on the erection of a new power plant for the Lorain County Electric Company in Lorain. The present plans provide for an initial installation of an 8000-kv. Westinghouse steam turbine and six 500-hp. Babcock & Wilcox boilers with Green chain-grate stokers. J. B. Johnson of Elyria is manager.

WATERVILLE, OHIO.—At an election held recently the proposal to issue bonds for the installation of an electric distribution system to provide electricity for street-lighting, commercial and domestic service was carried.

ASHLAND, KY.—Powell & Clarke of Ashland have been engaged as engineers for the proposed electric railway to be built from Ashland to Russell, Ky., a distance of 5 miles. The Vaughan Construction Company of Shawsville, Va., has the contract for construction of road. The railway may be extended to Greenup, Ky., 10 miles distant.

LANCASTER, KY.—The local electric-light plant, owned by Alex. Walker, it is reported, has been purchased by Bastin Brothers, who recently purchased the local electric-lighting franchise. The owners contemplate improvements to the plant and establishing a 24-hour service.

SCOTTSVILLE, KY.—The name of the Scottsville Electric Light Company has been changed to the Scottsville Light & Power Company.

SOMERSET, KY.—The Southern Machinery Exchange, Somerset, it is reported, would like to receive prices (dealers') on a 300-kva., three-phase, 60-cycle, 2200-volt generator and a 200-hp. motor and a three-phase, 60-cycle transformer.

FORT WAYNE, IND.—The Fort Wayne & Decatur Traction Company has petitioned the Public Service Commission for permission to issue $100,000 in bonds, of which part of the proceeds will be used for extensions and improvements.

REDKEY, IND.—The Town Board has entered into a contract with the Muncie Electric Light Company to replace the arc lamps now in use with nitrogen lamps of 600 cp.

FREEPORT, ILL.—Extensive improvements, it is reported, are contemplated by the Illinois Central Railroad Company to its local shops, involving an expenditure of about $100,000 during the coming summer. Of this amount about $20,000 will be expended for electrical equipment and an equal amount will be spent to equip the coal chute at the shops for electrical operation.

URBANA, ILL.—Bids will be received by the University of Illinois, Urbana, until May 30 for the general contracts, heating, plumbing and electrical work on two buildings estimated to cost about $400,000. The foundations are now in. James M. White is supervising architect.

CHILTON, WIS.—The local electric-light plant, it is reported, has been taken over by the Wisconsin Public Service Company of Green Bay. The company is planning to rebuild the system and extend its electric transmission lines from Green Bay into Chilton.

MILWAUKEE, WIS.—The Kempsmith Manufacturing Company of Milwaukee, which has doubled the capacity of its plant during the last six months, is contemplating further extensions. The output of the steam power plant is now being doubled. Paul E. Thomas is president and treasurer.

OSHKOSH, WIS.—Active work will soon begin on construction of the new electric light plant of the Oshkosh Gas Company.

HASTINGS, MINN.—Bids will be received by the Minnesota State Board of Control, State Capitol Building, St. Paul, until May 15 for construction of a service building, including general contract work, heating and ventilating, plumbing and electrical work, refrigerator, elevator and kitchen equipment. Plans and specifications are on file in the office of C. H. Johnston, architect, 715 Capitol Building, St. Paul, and at the office of the superintendent of the institution. Copies may be obtained on application to the State Board of Control upon deposit of $25.

ST. CLOUD, MINN.—Bids will be received by the City Commissioner of the city of St. Cloud until May 15 for construction of a two-story fire and police station. Separate bids to be submitted on general construction, heating and ventilating, electric wiring, steel cell work, etc. Plans and specifications may be obtained at the office of Buckley & Prins, architects, 252 Plymouth Building, Minneapolis, upon deposit of $10, of which $5 will be refunded upon return of plans.

CONROY, IOWA.—The Iowa Electric Company of Marengo is installing an electric distributing system in Conroy.

SIOUX CITY, IOWA.—The Sioux City Service Company, it is reported, is contemplating the construction of a new power plant, to cost about $750,000.

SPENCER, IOWA.—At an election to be held May 14 the proposal to issue $12,000 for the installation of an electric-light plant will be submitted to the voters.

BOONVILLE, MO.—Contract has been awarded to W. J. Cochran of Boonville for the construction of power house and the erection of 600 ft. of electric transmission line, to cost $22,000, for the Kemper Military School.

LA PLATA, MO.—The question of issuing bonds for the installation of a municipal electric light plant is under consideration.

LOUISIANA, MO.—Bids will be received by the Board of Supervisors of the Riverland Levee District, Louisiana, until May 21 for furnishing and erecting any or all parts of an oil-driven pumping plant. For further information address the Jacksonville (Ill.) Engineering Company, or J. Robert Johnston, secretary, Louisiana.

MAYVILLE, N. D.—Bids will be received by Charles Brewer, secretary of the state board of regents of North Dakota, at the office of Hancock Brothers, architects, 113 Broadway, Fargo, until May 25 for construction of dormitory building on the Normal School grounds at Mayville. Separate bids to be submitted on electrical work, plumbing, heating and ventilating. Plans and specifications may be seen at the office of the architects.

LAKE ANDES, S. D.—Bids will be received by the Commissioners of Charles Mix County, Lake Andes, until May 22, for the erection of a court house at Lake Andes, to cost about $150,000. Separate bids to be submitted for heating, electric wiring, jail equipment, etc. William L. Steele, United Bank Building, Sioux City, Iowa, is architect.

LESTERVILLE, S. D.—At an election held recently the proposal to issue $8,000 in bonds for the installation of a municipal electric-lighting plant was carried. An election will soon be called to vote on a proposal to issue additional bonds.

PLANKINTON, S. D.—Bonds to the amount of $16,000 have been voted for the purchase of local electric-light plant.

REDFIELD, S. D.—Bids will be received by the board of education, Redfield, until June 2 for construction of high school building, including general work, plumbing and sewerage, heating and ventilating and electrical work. Plans and specifications may be obtained upon application to William B. Ittner, architect, Board of Education Building, St. Louis, Mo. A deposit of $20 will be required for plans covering the general work and $10 for the plans for plumbing, heating and electrical work.

BENKELMAN, NEB.—A new 30-kw. General Electric direct-current generator is being installed in the municipal electric-light and water plant. A 10,000-gal. storage tank is being erected.

COURTENAY, NEB.—Bonds to the amount of $7,000 have been authorized for the installation of an electric-light plant in Courtenay.

EMERSON, NEB.—The property of the Emerson Light & Power Company has been purchased by the Nebraska Electric Company of Cedar Rapids, Iowa. Henry Jensen is local manager.

HUMPHREY, NEB.—Plans are being considered by Frank Huthmacher, owner of the municipal electric-light plant, for the installation of an oil engine and generator.

KEARNEY, NEB.—Negotiations have been closed whereby the property and holdings of the Kearney Water & Electric Company, including electric plant, gas works, the Kearney canal and extension lines, have been taken over by the L. E. Myer Company of Chicago, Ill. Extensions, including an addition to the present plant, widening of the canal and increasing the output for extension lines, it is understood, will be made by the new owners.

BARNARD, KAN.—The town of Barnard has granted F. E. Justice of Lincoln a franchise to furnish electrical service in Barnard for a period of 20 years.

BELOIT, KAN.—Bids will be received by C. R. Herrick, city clerk, Beloit, until May 15 for improvements to water-works system, including one 200-hp. water-tube boiler and boiler room equipment, two 400-gal. per minute, 300-ft. head, horizontal, motor-driven centrifugal pumps, two 400-gal. per minute, 30-ft. head, vertical, motor-driven centrifugal pumps; also building filter and power house, coal bunkers, etc. Plans and specifications may be obtained on application to Black & Veatch, engineers, Interstate Building, Kansas City, Mo., upon deposit of $25.

MANHATTAN, KAN.—Bids will be received by H. B. Winter, architect, Manhattan, until May 16 for the construction of Odd Fellows' Home at Eureka Lake, near Manhattan, to cost from $90,000 to $100,000. Separate bids to be submitted on heating and ventilating and electric wiring.

STOCKTON, KAN.—The town officials, it is reported, are considering improvements to the municipal electric-light plant.

Southern States

GREENSBORO, N. C.—The Greensboro Supply Company, it is reported, would like to receive prices on a 400 to 500-kw., three-phase, 60-cycle, 2300-volt revolving-field alternator directly connected to a uniflow or tandem-compound Corliss engine, together with exciter, switchboard, etc.

TRENTON, N. C.—A new electric-light plant is being installed by the Brock Electric Company to supply electrical service in Trenton. Furney Brock and others are interested in the project.

CHARLESTON, S. C.—The Charleston Consolidated Railway & Lighting Company is planning to erect a transformer station, to cost about $5,000.

SPARTANBURG, S. C.—The South Carolina Light, Power & Railways Company is planning to build a street railway extension to Whitney, and also to rebuild part of its Clifton line.

PENSACOLA, FLA.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until May 21 for a 200-ft. steel observation tower with electric elevator and an office building between the legs of the tower at the navy aeronautic station, Pensacola. Drawing and specification (No. 2367) can be obtained upon application to the above bureau or to the commandant of the naval station named.

ARLINGTON, TENN.—Work will soon begin on the installation of a municipal electric-light plant and water-works system in Arlington for which $15,000 in bonds have been sold. Oil engines will be used.

MERIDIAN, MISS.—Plans are being considered by John M. Dabney, mayor, for the establishment of an ice factory and cold storage plant, to cost about $75,000.

KENNER, LA.—The town of Kenner has awarded the contract for street-lighting to the Orleans-Kenner Electric Railway Company of New Orleans. Twenty-five lamps are to be erected.

CUSTER, OKLA.—The City Council is considering extending the municipal electric-lighting system to supply electricity in the farming districts.

McALESTER, OKLA.—The Choctaw Power & Light Company contemplates erecting an electric transmission line to Gowen.

OKLAHOMA CITY, OKLA.—The United States Garage Company is contemplating equipping a garage and machine shop, to cost about $50,000, of which $20,000 will be used for machinery.

CANYON CITY, TEX.—The City Council has entered into an arrangement with the Canyon Power Company for a test to be made at the city wells under which the company will furnish electricity to operate the pumps at the pumping station for 90 days to determine the cost as between the electrically operated pumps and the gasoline engines now in use.

Pacific and Mountain States

BREMERTON, WASH.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until May 28 for furnishing four 15-ton, motor-driven, traveling, revolving, hammerhead shipbuilding cranes at the navy yard, Puget Sound, Wash. Specification (No. 2374) can be obtained on application to the above bureau or to the commandant of the navy yard named.

OLYMPIA, WASH.—The Puget Sound Traction, Light & Power Company of Seattle has entered into a contract with the Olympia Light & Power Company to erect an electric transmission line from Fern Hill near Tacoma to the Boulevard road to connect with the service lines of the Olympia company. The cost of the work is estimated at $53,000.

SEATTLE, WASH.—The City Council has adopted a resolution declaring that the Sultan River project is not essential to the city of Seattle's plan for power development, and so far as the city is concerned the Sound Paper Company, which proposes to establish a paper mill and develop the water power of the Sultan River, is free to proceed with the development. The present plans of the company provide for an ultimate expenditure of $12,000,000. Scott Calhoun and S. P. Weston of Seattle are interested.

SEATTLE, WASH.—Bids opened April 27 by the Board of Works for a 13,500-hp. steam power plant at Lake Union revealed that the machinery alone will cost the city $350,000, against $187,000 paid for the machinery of the present plant of same capacity. The lowest bid for the building was $75,000, making the total minimum cost $425,000. The bond issue authorized is for $390,000 only, but there is also available for this purpose $70,000 left over in the light department fund from the last installation. Specifications will soon be issued for the proposed $3,000,000 hydroelectric plant and work on construction of same will be started as soon thereafter as legal formalities will permit.

BAKER CITY, ORE.—Plans have been completed by the Pacific States Timber Investment Company for a sawmill with a daily capacity of 1,500,000 ft. Electrically operated machinery will be installed.

HALFWAY, ORE.—The City Council has granted the Idaho Light & Power Company a franchise to furnish electricity in Halfway, and also awarded the company a contract for street-lighting for a period of ten years. The proposed transmission lines will extend from Robinette to Cornucopia.

KLAMATH FALLS, ORE.—Bids have been asked by the City Council for the construction of a municipal railway from Second Street and Klamath Avenue to a point near Dairy, 20 miles east of Klamath.

LOS ANGELES, CAL.—The American Mining & Development Company is considering the construction of an electric power plant and the installation of machinery and equipment at its property in Madera County.

LOS ANGELES, CAL.—Application has been made to the State Railroad Commission by the Southern California Edison Company for permission to purchase the electric plant of the Beverly Hills Utilities Company and to take over its franchises, at $23,347.

LOS ANGELES, CAL.—Work will begin at once on the construction of the proposed new railway shops for the Pacific Electric Railway Company at Torrence. The plans provide for 14 structures. The initial buildings will include a machine shop, an erecting plant and a paint shop, each 180 ft. x 450 ft.; a blacksmith shop, 150 ft. x 200 ft.; freight car plant, 175 ft. x 400 ft., and a power plant, 60 ft. x 120 ft. An appropriation of $1,000,000 is available for the work.

PASADENA, CAL.—An ordinance has been passed by the City Commission providing for the installation of an electric-lighting system on Lester Avenue, between Orange Grove Avenue and Rosella Drive.

SAN FRANCISCO, CAL.—The Great Western Power Company, 14 Sansome Street, has applied to the State Railroad Commission for permission to serve electricity in all parts of Plumas County not served by the Grizzly Electric Company, the Quincy Electric Light & Power Company and the Plumas Light & Power Company.

SUISIN, CAL.—The Vallejo (Cal.) Electric Light & Power Company has been granted a franchise to operate in Solano County.

CALDWELL, IDAHO.—The Caldwell Traction Company, it is reported, contemplates issuing $100,000 in bonds, the proceeds to be used for equipping its Wilder branch for electrical operation and an extension of its present system, including the construction of a loop extending through the Gem district and connecting the Lake Lowell branch with the Wilder branch.

GRANGEVILLE, IDAHO.—Work will soon begin on the construction of the proposed new dam and power house on South Fork. The original plans, calling for an expenditure of $50,000, have been enlarged and improvements costing $85,000 will be made.

LEWISTON, IDAHO.—The City Council has accepted the bid of the Washington-Idaho Light & Power Company for lighting the streets of the city and furnishing power for operating the pumping station for a period of ten years. The new contract provides for the installation of 30 ornamental lamp standards in the business district. Improvements, to cost about $15,000, will be made by the company.

OGDEN, UTAH.—Work will soon be started on the rebuilding of the electric transmission line of the Utah Power & Light Company through Ogden Canyon into Ogden Valley and also into the Eden district.

RICHFIELD, UTAH.—Extensions and improvements, it is reported, are contemplated by the Southern Utah Power Company and the Beaver River Power Company, controlled by L. L. Nunn, to cost about $500,000 and which will include the construction of one new power plant and putting into operation two plants that have been out of commission for more than two years and the erection of many miles of new electric transmission lines. The new power plant of the Beaver River Power Company is to be located directly below the present plant of the company. The Southern Utah Company will erect a high-tension transmission line from Richfield to Fillmore; also a number of short lines to other sections of Sevier, Beaver and Piute Counties to supply energy to mining companies and other industries in those districts.

MESA, ARIZ.—At a special election to be held May 15 the proposal to issue $125,000 in bonds for the construction of a municipal electric-light plant will be submitted to the voters.

PHOENIX, ARIZ.—The Magna Copper Company, it is reported, contemplates the construction of a 600-kw. electric plant to supply electricity to the Water Users' Association.

LIVINGSTON, MONT.—A resolution has been adopted by the City Council providing for the installation of an ornamental lighting system on certain streets of the city, to cost about $8,000.

COLORADO SPRINGS, COL.—The El Paso County Mutual Telephone Company is contemplating extensions of its systems to Jimmy Camp, Rush, Kendrick, Truckton and other points, which will call for the erection of 75 miles of line, at a cost of about $7,000.

WINNEMUCCA, NEV.—Arrangements are being made by the Nevada Valleys Power Company of Lovelocks for the erection of a high-tension transmission line from Winnemucca to Golconda, where it will supply energy to operate pumps for irrigating purposes, and thence down the Adelaide Valley, where it will connect with the main power line that is being erected from Rochester to Battle Mountain. The company proposes to make other extensions into adjacent territory from Winnemucca.

MOGOLLON, N. M.—An option has been taken, it is reported, on the partially finished hydroelectric plant commenced by B. W. Hill and associates by Charles E. Stewart of New York, N. Y., who proposes to finish the installation.

Canada

VANCOUVER, B. C.—The City Council has received an offer of another water power from the British Columbia-Iowa Lumber Company of Vancouver. The company states that the waterfall which it controls at the head of Salmon Arm, Sechlet Inlet, would develop from 20,000 hp. to 50,000 hp. in electrical energy at a comparatively low cost. The city already holds two water-power sites under option.

BRANTFORD, ONT.—The installation of a storage battery system, at a cost of $2,000, has been recommended by the fire chief.

CHARLTON, ONT.—The electric power plant in Charlton has been taken over by the Northern Ontario Light & Power Company of Cobalt, which will operate it as part of its holdings in northern Ontario. Extensions and improvements, it is understood, will be made to the system.

HAMILTON, ONT.—The installation of a steam turbine centrifugal pump having a capacity of 10,000,000 gal. per day and an additional electric unit of same capacity for the water-works plant has been recommended by Gray & Bain, engineers of Hamilton. The cost of the proposed equipment is estimated at $103,000.

STEPHEN TOWNSHIP, ONT.—Plans are being prepared by the Hydro-Electric Power Commission of Ontario for the erection of an electric transmission line through Stephen Township.

THETFORD MINES, QUE.—The ratepayers have approved the bylaw for construction of new dam for reservoir, to cost $50,000.

THREE RIVERS, QUE.—The St. Maurice Lumber Company is contemplating the construction of a concrete dam 1080 ft. long and power house at Les Forges Rapids, Que. The plans provide for the installation of six generating units of 10,500 hp. H. S. Ferguson, 100 Fifth Avenue, New York, N. Y., is consulting engineer. R. F. Grant is local manager.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until May 18 for furnishing, under circular No. 2125, one power hacksaw, belt-driven; 11 watthour meters, six holophane reflectors, etc. Bids will also be received until May 17 for furnishing, under circular No. 2126, one electric drill, 524 compression cups, 60 oil cups, 36 carbon dies, etc. For further information address Earl L. Brown, major corps of engineers, U. S. Army, general purchasing officer.

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until May 25 for furnishing steel, steel rails, steel ties and fittings, steel tumblers, wire rope, chain, electric motor, storage batteries, etc. Blanks and information relating to this circular (No. 1144) may be obtained upon application to the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and Fort Mason, San Francisco, Cal.

PEARL HARBOR, HAWAII.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until May 28 for furnishing one hydro-pneumatic freight elevator, structural framework and wire mesh inclosure complete at the naval station, Pearl Harbor, Hawaii. Drawing and specification (No. 2320) may be obtained at the above office or of the commandant of the navy yard named.

1,219,294. MACHINE FOR COILING WIRE; Fioravante Guida, New Haven, Conn. App. filed Oct. 13, 1916. Provides means for supporting the soft coils of wire as they are wound upon a drum, so that after it is vulcanized the wire will be perfectly round and the insulation uninjured.

1,224,126. CENTRIFUGAL SWITCH; Andrew H. Barken, Wilkinsburg, Pa. App. filed Jan. 24, 1914. Improvement.

1,224,131. WEATHER CAP; John C. Boyton and Oris H. Nicherson, Cleveland, Ohio. App. filed April 20, 1914. Improvement.

1,224,147. ELECTRIC PUMP GOVERNOR; Philip L. Crittenden, Edgewood, Pa. App. filed Aug. 5, 1915. Eliminate the flexible connection.

1,224,149. TRANSFORMER; Walter M. Dann, Wilkinsburg, Pa. App. filed Feb. 21, 1914. Employment of standard rolled-steel sections.

1,224,150. ARC-SUPPRESSING DEVICE; David C. Davis, Swissvale, Pa. App. filed June 9, 1914. Magnetic blow-out type.

1,224,160. DIRECT-CURRENT APPARATUS; Charles W. Girvin, San Francisco, Cal. App. filed May 12, 1913. Commutator may be employed as a part of a mechanism for generating current or of apparatus acting as a motor and employing direct current.

1,224,166. CONTROL SYSTEM FOR SINGLE-PHASE MOTORS; Rudolf E. Hellmund, Pittsburgh, Pa. App. filed Feb. 19, 1914. Automatically aiding the acceleration of a motor.

1,224,167. CONTROL SYSTEM; Rudolf E. Hellmund, Pittsburgh, Pa. App. filed March 23, 1914. Control of alternating-current motors of the commutator type.

1,224,171. ELECTRODYNAMOMETER INSTRUMENT; John T. Irwin, London, England. App. filed Nov. 26, 1913. Astatic.

1,224,172. PROTECTIVE MEANS FOR AN ELECTRICAL DISTRIBUTING SYSTEM; Ray P. Jackson, Edgewood Park, Pa. App. filed July 14, 1915. Improvement.

1,224,184. TRANSFORMER INSULATION; William M. McConahey, Pittsburgh, Pa. App. filed Jan. 30, 1914. Means for insulating the current-carrying windings thereof.

1,224,186. CIRCUIT INTERRUPTER; Joseph N. Mahoney, Wilkinsburg, Pa. App. filed Aug. 11, 1913. Contact members for oil-insulated circuit breakers.

1,224,206. COMMUTATOR CYLINDER FOR DYNAMO-ELECTRIC MACHINES; William S. Pyrah, Old Trafford, England. App. filed March 24, 1915. Improvement.

1,224,210. TRANSFORMER-CORE PUNCHING; Emerson G. Reed, Wilkinsburg, Pa. App. filed Dec. 26, 1913. Of such form as to insure a maximum economy of material and a reduction in the expenses of operation and in the losses of transformers.

1,224,222. ELECTRIC SWITCH; Louis B. Sears, Corry, Pa. App. filed Nov. 27, 1915. Push-buttons.

1,224,225. TRANSFORMER; Ferdinand Sieber, Vado Ligure, Italy. App. filed June 24, 1912. Coils are disposed one above another with layers of insulating material inserted between them.

1,224,227. LOOM FASTENER; Edward S. Snover, Toledo, Ohio. App. filed Sept. 5, 1916. Formed of wire.

1,224,255. TRANSFORMING SYSTEM; Vern E. Alden, Wilkinsburg, Pa. App. filed March 30, 1915. Transfer energy between two systems that transmit alternating currents of unlike numbers of phases.

1,224,259. INSULATOR; Frank Bement and Edward A. Logan, Shrewsbury, Mass. App. filed Nov. 15, 1915. On high-tension wires to prevent leakage of the current where they engage branches of trees or buildings.

1,224,269. FITTING FOR ELECTRICAL CONDUIT SYSTEMS; David L. J. Broadbent, Southport, England. App. filed June 11, 1914. Improvements.

1,224,307. ARC-WELDING APPARATUS; James F. Lincoln, Cleveland, Ohio. App. filed Dec. 23, 1915. Relates to electric current generation control.

1,224,313. THERMOSTATIC REGULATOR; John Nathan, Los Angeles, Cal. App. filed Feb. 8, 1915. By the expansion and contraction of a fluid.

Record of Electrical Patents

Notes on United States Patents issued on May 1, 1917

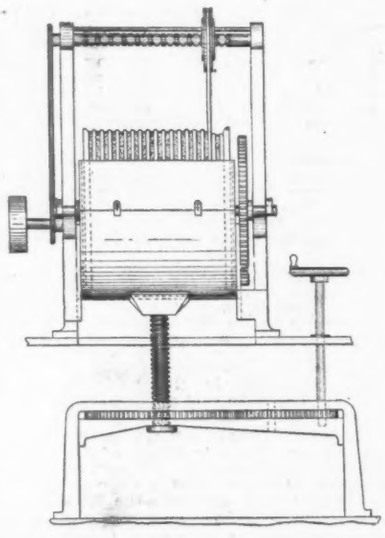
1,224,316. MEANS FOR ATTACHING ELECTRICAL APPLIANCES TO CONDUIT OUTLET BOXES; John E. Parker and Daniel B. Winter, Syracuse, N. Y. App. filed July 27, 1911. New and useful means.

1,224,320. TERMINAL FITTING FOR ELECTRIC CONDUITS; James C. Phelps, Springfield, Mass. App. filed Oct. 2, 1914. For closing the ends of iron conduits which are used for electric wires.

1,224,326. APPARATUS FOR HOUSEHOLD COOKING; Andreas Saxegaard, Stavanger, Norway. App. filed May 7, 1914. Utilizes electric current.

1,224,330. SAFETY DEVICE FOR ELECTRICAL SYSTEMS; Lester Siebenhauer, San Francisco, Cal. App. filed Sept. 27, 1915. Adapted to overcome the burning out of motors and is designed for positioning between the source of supply and the motor.

1,224,332. ELECTRICAL PROTECTIVE DEVICE; Benjamin H. Smith, Turtle Creek, Pa. App. filed March 7, 1916. Means for protecting electrical translating devices in accordance with the temperatures thereof.



1,219,294—Machine for Coiling Wire

1,334,337. SWITCH; Halfdan A. Steen, Norwood, Ohio. App. filed March 23, 1912. Oil switches.

1,334,370. ELECTRICAL PROTECTIVE DEVICE; Charles LeG. Fortescue, Pittsburgh, Pa. App. filed May 3, 1916. Means for protecting electrical translating devices in accordance with the temperatures thereof.

1,224,385. MEANS FOR INDICATING ABNORMAL TEMPERATURES IN VEGETABLE MATTER; Alfred D. Kennedy, Greenville, S. C. App. filed May 22, 1915. Within piles of cottonseed, cottonseed hulls, grains or other material subject to increase of the internal temperature to a harmful degree.

1,224,386. LIGHTING APPLIANCE; Lawrence Langner, New York City, N. Y. App. filed Feb. 3, 1915. "Semi-indirect" type.

1,224,400. ELECTRICAL PROTECTIVE DEVICE; Paul MacGahan, Pittsburgh, Pa. App. filed Aug. 9, 1915. Actuated only when the load traversing a translating device is of a predetermined value.

1,224,408. ELECTRICAL PROTECTIVE DEVICE; Laurence M. Perkins, Wilkinsburg, Pa. App. filed Oct. 30, 1916. Improvement.

1,224,409. BARRIER CUT-OUT SWITCH; James C. Phelps, Springfield, Mass. App. filed Nov. 19, 1915. Sectional fuse blocks.

1,224,434. STORAGE BATTERY; Theodore A. Willard, Cleveland, Ohio. App. filed May 12, 1915. Method of sealing the jar and battery box.

1,224,455. PRIMARY BATTERY; George S. Engle, Cranston, R. I. App. filed May 5, 1914. Provides means for air-venting the cell.

1,224,458. HYDROMETALLURGY OF COPPER; John C. Greenway, Warren, Ariz., and Harry W. Morse, Los Angeles, Cal. App. filed June 5, 1916. Maintains a very low concentration of ferric sulphate in the electrolyte.

1,224,505. ATTACHMENT PLUG; Ralph A. Schoenberg, New York, N. Y. App. filed April 22, 1916. Structural improvements.

1,224,508. CONTROL MECHANISM FOR SEWING-MACHINE MOTORS; Harry E. Sellers, Wausau, Wis. App. filed Feb. 5, 1916. Support for such element whereby it may be placed on the floor and conveniently connected to the treadle of a sewing machine.

1,224,518. ARMATURE CONSTRUCTION FOR DYNAMO-ELECTRIC MACHINES; Vincent G. Apple, Dayton, Ohio. App. filed Nov. 19, 1914. Improve armature structure.

1,224,542. CIRCUIT CONTROLLER; William S. Henry, Rochester, N. Y. App. filed Jan. 18, 1913. Will act both as a drag and a snap-circuit controller.

1,224,576. MOLDING-BASE CANOPY SEAT; Allison S. Smith, Bellaire, Ohio. App. filed May 1, 1916. Designed to receive the ends of wire-inclosing moldings.

1,224,580. ORE-SEPARATING MACHINE; Herbert H. Thompson, Aldridge, and Alfred E. Davies, Hockley Heath, England. App. filed Oct. 13, 1915. Armature rotating adjacent to the ore carrier.

1,224,602. ELECTRICAL APPARATUS; Alexander Churchward, Boston, Mass. App. filed April 23, 1915. Motors or generators comprising a revolving armature and a stationary field.

1,224,610. RHEOSTAT; Matthey S. Cumner, New York City, N. Y., and Frederick W. Geissenhainer, Freehold, N. J. App. filed Dec. 11, 1914. Adapted for controlling the intensity of an electric light so as to secure the best results when the light is utilized for photographic printing from a motion picture or other film or roll.

1,224,639. APPARATUS FOR TRANSFORMING ELECTRICAL ENERGY; Peter C. Hewitt, New York City, N. Y. App. filed July 1, 1905. Interrupters having a disintegrating and restrictive negative electrode such as mercury.

1,224,689. SYSTEM OF ELECTRICAL DISTRIBUTION; Percy H. Thomas, Upper Montclair, N. J. App. filed March 29, 1913. Utilizes vapor electric rectifiers connected between the direct-current line and the alternating receiving circuits to accomplish the suppression of the current flow during the periods of wrongly directed electromotive force.

1,224,729. ROTARY CONVERTER; Lionel Fleischmann, Berlin, Germany. App. filed May 12, 1914. Method of starting.

1,224,741. INDICATOR AND FLUID CONTAINERS; George P. Hewis, Regina, Saskatchewan, Canada. App. filed July 21, 1916. Electro-mechanical indicators for fluid containers.

1,224,827. CONTROLLER FOR INDICATING SYSTEMS; Adolph Zeisel, Bel Air, Md. App. filed Feb. 1, 1916. Improvements.

1,224,856. ELECTRICAL CONNECTION; William A. Chryst, Dayton, Ohio. App. filed May 13, 1912. Machines wherein a commutator and co-operating brushes are employed.

1,224,864. PORTABLE ELECTRIC-LAMP HOLDER; Clarence Carson, New York City, N. Y. App. filed Feb. 24, 1915. Improvements.

1,224,881. ELECTRIC SWITCH AND FUSE BOX; Lawrence F. Kries, Baltimore, Md. App. filed Aug. 30, 1913. Designed to permit opening whenever necessary for inspection or renewal.